

ACCENT AND GROUPING STRUCTURES IN THE
STRING QUARTETS OF BÉLA BARTÓK

Cheryl D. Bocanegra, B.M., M.M.E.

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APPROVED:

Paul E. Dworak, Major Professor
Thomas Clark, Minor Professor
Jon C. Nelson, Committee Member
Thomas Clark, Interim Dean of the College of Music
C. Neal Tate, Dean of the Robert B. Toulouse School of
Graduate Studies

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The music of Béla Bartók is defined in part by its unique blend of rhythmic vitality and inventiveness, and his string quartets offer a glimpse into a consistency of technique evident throughout his compositional career. Bartók's rhythmic environments are primarily metrical, but many of his rhythmic configurations are placed in such a way as to potentially override established meter. It is necessary, therefore, to institute an analytical means by which the delineation and comparison of rhythmic structures both within and without the metrical context may be accomplished.

An analytical method using Timepoint Accent Structures (TAS) allows for the comparison of rhythms resulting from patterns of accent produced by pitch onset, dynamic stress, articulation or any other accentual factors. Timepoint Grouping Structures (TGS) delineate the number of timepoints present in alternating groups/blocks in a texture, thereby allowing for the recognition of patterning created by these larger groups. By applying TAS and TGS analysis, relationships of rhythmic equivalency, rotation, retrograde, complementation, augmentation, diminution, subset, superset, exchange, compression and expansion are clearly confirmed in the string quartets. In addition, symmetrical structures and arithmetic progressions are discovered. In many ways, Bartók's rhythmic organization mimics his procedures of pitch structuring.

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CHAPTER 1

CURRENT RESEARCH RELATED TO THE ANALYSIS OF

BARTÓK'S RHYTHMIC STYLE

Elements of Bartók's Rhythmic Style

A composer's treatment and organization of the various musical elements determines in part the composer's style. Listeners are readily able to recognize a particular composer's treatment of materials. Consider, for example, the contrapuntal mastery of Bach, the textural clarity of Mozart, and Wagner's avoidance of harmonic resolution. These musical details provide identity and contribute in great amount to the very definition of the composer's works. One of the prominent features that defines the style of Béla Bartók is his treatment of rhythm, an element that provides drive and vitality in his music. To be more specific, Bartók's various rhythmic textures are characterized by the following features:

1. A pervasive use of syncopation
2. Metrical alterations
3. A frequent use of ostinatos
4. Recitative-like passages in a free rhythmic style
5. Surprising rhythmic punctuations
6. Alternating short sections that consist of contrasting textures
7. An affinity for extensive motivic manipulation

While Bartók uses elements such as melodic design, scalar constructs, and structural organization in a distinctive way, his rhythmic techniques most clearly

distinguish his music. As of yet, these rhythmic properties have not been thoroughly explored by other authors; instead, they have been almost completely neglected, particularly from an analytical point of view. More authors have discussed the origins of his rhythmic style than they have his specific rhythmic designs, which he derived primarily from the regional folk music that he collected and studied.

The Special Role of Peasant Songs in Bartók's World

In his own writings, essays and lectures, Bartók acknowledges that the peasant songs of his region provided a significant source of new compositional materials. While he said little about his own compositional processes, he spoke a great deal about the folk music he collected and his discoveries regarding their content. He considered this music to be an elevated form of art. “According to the way I feel, a genuine peasant melody of our land is a musical example of a perfected art. I consider it quite as much a masterpiece, for instance, in miniature, as a Bach fugue or a Mozart sonata movement is a masterpiece in a larger form.”¹

His enthusiasm for peasant music and the influence it had on his compositional style compelled Bartók to encourage others to allow this music to affect their own works. He felt that these songs had the ability to “awake the emotions in the soul of the composer.”² Of course, listening to these songs in their intended context would allow for greatest impact and understanding.

[Peasant music's] influence is most effective for the musician if he acquaints himself with folk music in the form in which it lives, in unbridled strength, amidst the lower people, and not by means of

¹ Benjamin Suchoff, ed., *Béla Bartók Essays* (New York: St. Martin's Press, 1976), 333.

² Ibid., 324.

inanimate collections of folk music which anyway lack adequate diatonic symbols capable of restoring their minute nuances and throbbing life. If he surrenders himself to the impact of this living folk music and to all the circumstances which are the conditions of this life, and if he reflects in his works the effects of these impressions, then we might say of him that he has portrayed therein a part of life.³

Through both conscious effort and subconscious assimilation, Bartók incorporated elements of this admired music directly and indirectly into his own works. Peasant melodies that he transcribed and harmonized are primarily found in the songs and piano works. Examples of genuine peasant melodies are found in *Twenty Hungarian Folk Songs* and the fourth and fifth of the *Fourteen Bagatelles for Piano, Op. 6*. Bartók discusses the more vague issue of the infiltration of non-specific elements in his works:

[I]n our case, it was not a question of merely taking unique melodies in any way whatsoever, and then incorporating them--or fragments of them--in our works, there to develop them according to the traditionally established custom. This would have been mere craftsmanship, and could have led to no new and unified style. What we had to do was to grasp the spirit of this hitherto unknown music and to make this spirit (difficult to describe in words) the basis of our works.⁴

There are also a number of letters and essays in which Bartók speaks in broad terms about the peasant music rhythms, noting the particular qualities of different types of melodies. His music undoubtedly inherits rhythmic materials indirectly from these songs, since he refers to them as inspirational sources for his own compositional style.

I also mention the quite incredible rhythmic variety inherent in our peasant melodies. We find the utmost conceivable free, rhythmic spontaneity in our parlando-rubato melodies; in the melodies with a fixed dance rhythm the most curious, most inspiring rhythmic combinations are to be found. It therefore goes without saying that this circumstance pointed the way to altogether novel rhythmic possibilities for us.⁵

³ Ibid., 318.

⁴ Ibid., 333.

⁵ Ibid., 338.

On numerous occasions throughout his life, Bartók reiterated his findings on the basic rhythmic styles in the peasant music he catalogued. In the following excerpt, he reveals more detail than previously noted.

Three kinds of rhythm prevail in Eastern European rural music. First is the *parlando-rubato*, that is, free, declamatory rhythm without regular bars or regular time signatures. Its nearest equivalent in Western European art music may be found in recitative music; Gregorian music probably had a similar rhythm. Second is the more or less rigid rhythm, with regularly set bars, generally in 2/4 time. In certain types, change of measure may occur—which leads in some cases to seemingly complicated rhythms. The third kind of rhythm is the so-called ‘dotted’ rhythm especially characteristic for certain types of Hungarian rural music. Our dotted rhythm is a combination of (these three) rhythmic patterns.⁶

Persons familiar with his works will immediately recall particular passages that embody characteristics of these three rhythmic styles.

Certain rhythmic qualities are clearly inherent in the works of Bartók. His writings provide evidence to support the influence of peasant music, not only in his use of pitch and harmony but also in his rhythmic design and structure. Surely the “spirit of the music” he attempts to capture is at least partially characterized by its robust, driving or recitative-like rhythmic content.

Studies of the Music of Bartók

János Kárpáti

Because Bartók repeatedly mentions folk influences, some researchers have tried to find the influence of specific folk songs on his compositions. János Kárpáti is one of a group of prominent Hungarian scholars to discuss these associations, and he often notes specific connections between the musical product and the presumed inspiration. In his

⁶ Ibid., 383-4.

book, *Bartók's Chamber Music* (1994), he cites several works that are melodic transcriptions of folk songs with accompaniments supplied by the composer. A much larger number of Bartók's compositions contain borrowed elements, such as scalar materials and certain melodic features; Kárpáti offers insight into some of these specific derivations.

Although the details of these affiliations are quite fascinating, other researchers are hesitant to discuss their effects, particularly those who are not native to a region where folk music originates. Carl Dahlhaus conveys his own reluctance to acknowledge that regional folk rhythms influenced the music of Stravinsky.

I shall also avoid the temptation to move from descriptions to suppositions regarding (the rhythms') ancestral history, because the method of ascribing to folklore all the phenomena that cannot be explained on the basis of the tradition of European art music—a folklore which cannot be properly understood by someone who has not grown up in it—is probably of questionable methodological legitimacy, to say the very least.⁷

Kárpáti's book primarily focuses on the string quartets and contains much more information than merely the examination of folk music connections. He discusses a wide array of topics including historical matters of import surrounding the composition of each work, some of the analytical discoveries of other researchers, and the relative importance of the quartets (individually and as a whole) to Bartók's oeuvre and the genre itself. With regard to rhythm, Kárpáti cites evidence of rhythmic nuances apparent in folk melodies and specific folk patterns utilized in the ostinatos of some of the string quartets.⁸ (Some of these patterns will be discussed in Chapter 4).

⁷ Carl Dahlhaus, "Problems of Rhythm in the New Music," In *Schoenberg and the New Music: Essays by Carl Dahlhaus*, trans. Derrick Puffett and Alfred Clayton (Cambridge: University Press, 1987), 46.

⁸ János Kárpáti, *Bartók's Chamber Music*, trans. Fred Macnicol and Maria Steiner (Stuyvesant: Pendragon Press, 1994), 99.

Elliott Antokoletz

Elliott Antokoletz is another important Bartók scholar who has contributed an enormous amount of research to the study of his music and has consolidated much of what many consider to be the most significant findings in this music since the 1940's. In *The Music of Béla Bartók: A Study of Tonality and Progression in Twentieth-Century Music* (1984), he incorporates the earlier research of Milton Babbitt, George Perle and Leo Treitler (regarding the discoveries of pitch cells), and provides an extensive analysis utilizing these and other fascinating generative structures. His is a comprehensive analytical work with substantial discussions of symmetrical constructs, interval cycles, pitch class sets, and scale formations.

Antokoletz also addresses the peasant influence, citing specific folk elements in Bartók's works, but most of his materials serve as reinforcements of the discoveries offered by Kárpáti. Antokoletz, however, views the examination of folk elements alone as inadequate. He asserts that studies of Bartók's musical language should include investigations of folk elements and concepts, as well as practices of contemporary art music. Both Antokoletz and Kárpáti credit Bartók with the extraordinary ability to create a musical product reflecting the amalgamation of folk and art musics, and in his mature works this fusion is most evident. The result is a "highly complex and systematic network of divergent chords and scales. Bartók's comments regarding the means by which he derived his harmonies from modal folk melodies suggest a link between the folk-music sources and certain procedures associated with serial composition."⁹

⁹ Elliott Antokoletz, *The Music of Béla Bartók: A Study of Tonality and Progression in Twentieth-Century Music* (Berkeley: University of California Press, 1984), 1.

Antokoletz provides a number of isolated references to specific rhythmic properties in his book. As previously noted, he speaks of some of the same features as Kárpáti, particularly with regard to Magyar and Bulgarian rhythms, but also makes note of additive rhythmic structures found in several locations. Antokoletz's master's thesis entitled, "Rhythmic Form in Three of Bartók's String Quartets," contains some of the same information on additive structures. His thesis is particularly important to my study because it is the only existing work available dealing exclusively with Bartók's rhythmic devices. In his study, Antokoletz analyzes rhythmic form by identifying areas of rhythmic tension. Relative tension is determined by the coincidence of factors involving tempo changes, metric changes, rhythmic grouping, rhythmic consonance and dissonance and the presentation and modification of rhythmic patterns. Although some of these same topics will be addressed in my study, there are significant differences in approach, representation and findings. I will provide more details of his discoveries in later chapters, citing correlations and distinctions between his findings and my own.

Ernö Lendvai

One final influential author in Bartók research must be cited: Ernő Lendvai. His much-discussed book, *Béla Bartók: An Analysis of His Style* (1971), has been a topic of debate for several decades; yet, many respectable theorists credit Lendvai with providing theoretical insight into the formal design and pitch organization of Bartók's compositions. His conclusions revolve around a number of suppositions: an axis system organizes tonal materials; an "acoustic" system organizes harmonic content; and the application of golden section and Fibonacci series proportions govern form and proportional design. The data he presents on the structural proportions of Bartók's compositions most

convincingly confirm his hypotheses. Lendvai also contributes to the understanding of Bartók's use of rhythm, albeit on a larger scale than I will discuss in the present study.

Although I have briefly discussed the contents of only three authors' works above, there are many others who have contributed to the understanding of Bartók's music. Babbitt, Perle and Treitler were mentioned earlier, and others must also be recognized as significant: László Somfai, Paul Wilson, Arnold Whittall, Wallace Berry, Jonathan Bernard, Allen Forte, Benjamin Suchoff, Roy Travis, Felix Salzer and Malcolm Gillies. Even though these and other scholars have demonstrated considerable activity on several planes in Bartókian research, they rarely discuss the details of his rhythmic design. Not surprisingly, rhythmic analysis is ancillary to that of pitch and form. Of course, this is comparable to the place given rhythmic study in the works of almost any other composer.

An Overview of Current Issues in Studies of Rhythm and Time

Theoretical research in the areas of rhythm and time has lagged far behind that of other musical elements. In recent decades, however, scholars have shown an increased interest in formulating ideas and concepts focused on the rhythmic content of music. Even so, progress has been slow, in part because time-related concepts are often difficult to define precisely. As a musical community, we seem to disagree on definitions of even the most basic terms, such as *meter* and *rhythm*. Lewis Rowell comments on his perception of the general condition of music research involving time.

If what we have been seeking is a 'grand solution,' an intellectual breakthrough that enables us to understand the temporality of music in fundamentally new and satisfying ways, I fear that we are not much nearer than we were in 1960. Part of the problem lies in the word itself. Time is

such a convenient, all-encompassing term for such a variety of concepts and precepts that it seduces us into believing it to be a single thing.¹⁰

Advancement is further aggravated by the changing rhythmic techniques of composers in the twentieth century. Unlike established rhythmic treatments of preceding style periods, newer music utilizes gestural composition, non-linearity and non-metrical environments, and these concepts present a distinct set of difficulties. Some analytical techniques relating to tonal music can reasonably find application in twentieth century works, but we struggle to move beyond philosophical discussion toward analytical methodologies. (It must be noted here that securing an analytical method has not been the primary goal of many of the scholars involved in the study of rhythm.)

Although a comprehensive and exhaustive theory of rhythm is not in sight, many scholars have invested a great deal of effort in gaining knowledge and exploring many avenues in order to understand rhythm and time more completely. Many respected scholars of the twentieth century have contributed efforts in numerous subcategories of rhythmic study. The following is by no means an exhaustive listing but serves to highlight some of the more influential works in each of the areas mentioned:

1. The synthesis of poetic accent patterns and musical rhythm - Grosvenor Cooper and Leonard Meyer (1960), Barney Childs (1981)
2. Phrase rhythm analysis - William Rothstein (1989), Arthur Komar (1979), Carl Schachter (1976, 1980, 1987)

¹⁰ Lewis Rowell, "The Study of Time in Music: A Quarter-Century Perspective," *Indiana Theory Review*, 17/2 (Fall 1996): 63.

3. Stratification and products of interaction between layers - Maury Yeston (1976), Arthur Komar (1979), Carl Schachter (1976, 1980, 1987), Jean Little (1971)
4. Issues of Meter or Accent - Christopher Hasty (1997), William Benjamin (1984), Wallace Berry (1976), Joel Lester (1986), Jay Rahn (1978), John Graziano (1975), Victor Zuckerkandl (1956)
5. Philosophical studies of time - Lewis Rowell (1985), David Epstein (1979), Jonathan Kramer (1988), Christopher Hasty (1981, 1997), Karlheinz Stockhausen (1958, 1959)
6. Rhythmic Perception - Fred Lerdahl and Ray Jackendoff (1983), Justin London (1993), Dirk-Jan Povel and Peter Essens (1985), Candace Brower (1993), Stephen Handel (1984), Jonathan Kramer (1988)

Other authors have also developed analytical methodologies that describe rhythmic relationships within a work or that integrate rhythm analysis with that of pitch, form and other musical elements. In two published articles from the 1980s, Allen Forte offers an informative look into the rhythmic structure of pieces by Webern and other 20th century composers. Others, such as Pieter van den Toorn, Gretchen Horlacher, Marianne Kielian-Gilbert, Jonathan Kramer and Dwight Andrews have made considerable advances in discovering some of the rhythmic processes of Stravinsky. Elizabeth West Marvin, John Roeder, Douglas Jarman, and Willie Anku have contributed valuable findings as related to the rhythms of additional compositions or improvised pieces. Still, the community of scholars has advanced little in understanding the structures and

organization of rhythm. In 1987, Dahlhaus expressed his desire for a greater comprehension of Stravinsky's rhythmic materials by way of analysis:

[A]fter half a century there is no excuse for the fact that hardly anything relevant to the problems of rhythm has been said in detail other than in Alban Berg's essay, 'Why is Schoenberg's Music So Difficult to Understand?' Rhythm in Stravinsky is unremittingly cited, extolled and adorned with a critical vocabulary whose vagueness stands out strangely from the precision of the object described; analysis, however, has hardly been attempted.¹¹

Goals of this Study

Given the paucity of research into the rhythmic details of twentieth century music, specifically in the works of Bartók, I will present a methodology that will allow for the discussion of distinct rhythmic elements. This methodology will:

1. provide a means for identifying and representing prominent or significant rhythmic structures;
2. supply a means for comparing these structures and determining the possibilities for relationships between them;
3. apply these procedures to various levels of structure; and
4. utilize findings on pitch organization as a starting point for studying rhythmic organization.

I have chosen to examine selected materials from each of the six string quartets of Bartók, as they contain some of the most memorable and diverse rhythmic materials found in his works. Although the rhythmic style described earlier is generally representative of Bartók's compositions, there seems to be a concentration of these rhythmic elements in the quartets. In addition, I believe that with each quartet Bartók

¹¹ Dahlhaus, 45.

demonstrates an increased sophistication in rhythmic treatment; at the same time, his music retains the basic characteristics that define his rhythmic style.

Another factor influencing my decision to analyze the quartets is the fact that extensive research of pitch and form cited earlier has produced a great deal of information regarding organizational details of these works. Pitch cells play a prominent role in melody and harmony, scales and harmonic systems are modified systematically, and formal dimensions often adhere to specific patterns. In view of this knowledge, it is entirely possible that rhythmic design could follow a similar approach. The analytical discoveries of Babbitt, Perle and Antokoletz will serve as foundational materials for the analysis of rhythmic structures in this study.

The string quartets are a logical choice for analysis, not only because of their rhythmic characteristics and pitch organization, but because these quartets are widely held to be representative of Bartók's total compositional output. Kárpáti maintains that these string quartets occupy an important place in Bartók's oeuvre.

[I]n Bartók's case the chamber music is not simply a matter of grouping according to genre: it is really the framework for his whole oeuvre. This applies especially to the string quartets, which accompany Bartók through his creative life from the very earliest youthful efforts to the last and unfulfilled plan of his life, the 'seventh' String Quartet.¹²

Theoretically, an analysis of the rhythmic structure of these quartets could provide a glimpse into the evolution of Bartók's rhythmic techniques throughout his entire body of work. Perhaps analysis could also reveal consistencies in rhythmic approach over time. In either case, the examination of these quartets will expose rhythmic tendencies of a single composer in an important set of compositions spanning a period of 31 years. In

¹² Kárpáti, 1.

addition, the decision to restrict analysis to one genre potentially enables one to view the development of a single musical component, unaffected by changes in instrumentation. Composing for different groups of instruments can affect the manner in which a composer writes. By limiting analysis to a single genre, it is possible that changes in rhythmic design can be observed in a more pure state. Alterations in compositional technique will then have been the result of influence and invention, rather than an adjustment to changes in instrumentation.

The position of the quartets in the whole of the genre is also notable, as George Perle points out:

In their exploration of the sonic resources of the medium and in their display of its virtuosic possibilities, the Bartók quartets represent, along with the First and Second Quartets of Schoenberg, the Five Movements and the Bagatelles of Webern, and the String Quartet and Lyric Suite of Alban Berg, the first real advance beyond the late works of Beethoven. But Bartók's contributions to the medium are almost equivalent in quantity to the total contributions of Schoenberg, Berg and Webern, and have a special value in their overall unity and interrelatedness as the work of a single composer—a composer whose development, in spite of the distinctive features that characterize the different stages of that development, is remarkably consistent.¹³

The significant place the string quartets hold, both in the genre and Bartók's oeuvre, is a convenient circumstance for this study; my impetus for research into these particular pieces derives not only from the notability of the works but also from a pure attraction to the *sound*. There is a motivation to respond to the intense rhythmic character embodied in these works by attempting to discover the *nuts and bolts* that work together to build

¹³ Perle, George. "The String Quartets of Béla Bartók." in *A Musical Offering: Essays in Honor of Martin Bernstein*. Ed. Edward H. Clinkscale and Claire Brooke. (New York: Pendragon, Press, 1977), 196.

such remarkably effective and expressive pieces. In detailing the rhythmic organization of the quartets, I will uncover some of Bartók's rhythmic designs.

CHAPTER 2

ACCENT, GROUPING AND SEGMENTATION

A number of important sources extensively address issues of musical rhythm. These include *The Time of Music* (Kramer 1988), *A Generative Theory of Tonal Music* (Lerdahl and Jackendoff 1983), *The Rhythms of Tonal Music* (Lester 1986), and *The Rhythmic Structure of Music* (Cooper and Meyer 1960). Each of these books contains discussions on the interrelated topics of accent, grouping and segmentation. Establishing one's positions on these topics at the outset is necessary, because a theorist's approach to rhythm is fundamentally determined by his or her understanding of accent, which in turn affects grouping and segmentation. Wallace Berry confirms the importance of addressing the issue of accent: "No penetrating approach to the study of rhythmic structure is conceivable without insistent efforts in the direction of a comprehensive statement of criteria by which accent is evaluated."¹

In the following sections, I will present a basic summary of relevant materials regarding accent, grouping and segmentation, and I will highlight the major similarities and differences among prominent authors. I will then clarify my own position on each subject and discuss the manner in which this will affect the methodological approach that I apply in this study.

¹ Wallace Berry, *The Structural Functions of Music*, (New York, Dover Publications, 1976), 338.

Accent and Its Many Manifestations

Basic Definitions and Accent Factors

Since this study deals with accent structures, I will first define what accent *is*. It is fair to say that many musicians assume accent to mean an increase in dynamic level on a given timepoint. This notion obviously results from direct association with the notational sign “>,” commonly known as an *accent mark*. While this understanding is partly accurate, theorists prefer a much broader definition that encompasses the entire range of factors or elements that cause a sound or a point in musical time to be set apart relative to its surroundings. Cooper and Meyer explain:

An accent, then, is a stimulus (in a series of stimuli) which is *marked for consciousness* in some way. . . . Accent must not be confused with stress. The term ‘*stress*,’ as used in this book, means the dynamic intensification of a beat, whether accented or unaccented.²

In their article dealing specifically with accent structures, Drake and Palmer confirm Cooper and Meyer’s definition when stating: “An accent is an event that stands out and captures a listener’s attention.”³ Joel Lester defines accent in a similar way but follows a line of logic that takes a slightly different angle:

An accent is a point of emphasis. In order for a point in musical time to be accented, something must occur to mark that point. It is the beginning of a musical event that marks off accented points in time. Accents are, therefore, points of initiation.⁴

In these sources and many others, authors agree that accent is much more than dynamic intensification; its definition is consistently expanded to include anything

² Grosvenor Cooper and Leonard Meyer, *The Rhythmic Structure of Music* (Chicago: University of Chicago Press, 1960), 8.

³ Carolyn Drake and Caroline Palmer, “Accent Structures in Music Performance,” *Music Perception*, 10/3 (1993), 344.

⁴ Joel Lester, *The Rhythms of Tonal Music* (Carbondale: Southern Illinois University Press, 1986), 16.

bringing heightened focus to a particular event or point in musical time. However, there is some disagreement as to which musical elements actually possess the qualities necessary for producing accent. Lester provides a list of seven of the most common factors that contribute to accent.

1. Long Durations
2. New Events (pitch change, harmonic change, textural change)
3. Textural Accents (voice entrance, new registers)
4. Contour Changes
5. Dynamic Changes
6. Articulation
7. Pattern (Motive) Beginning⁵

Wallace Berry provides an extensive list of accentual criteria in *The Structural Functions of Music* (1976). He mentions several accent-types not covered by Lester, such as a change to a faster tempo, approach by leaps in lines, and a change to more intense timbre. Since his discussion centers mainly around rhythm and meter, he presents a number of other factors that deal with the preparation or confirmation of meter. These include: preceding or anticipative impulse, proximate events that follow the initiative closely in time, and the effect of pulse and metric unit on an event.⁶

Other Accent Factors

In addition to those already mentioned, there are several other accent-producing factors recognized by different authors. For example, John Graziano speaks of the

⁵ Ibid., 18-37.

⁶ Berry, 338-344.

accentual tendencies of melodic intervals. His conclusions are based on findings from psychological studies attempting to ascertain whether individuals perceive a specific pitch of a melodic interval as dominant or accented. These studies confirm that most isolated melodic intervals exhibit beginning- or end-accentuation based on the controlling nature of one of the pitches.⁷ Of course, findings related to isolated intervals do not necessarily apply when those intervals occur within a piece of music. The tonal or nontonal context of individual pitches has an overwhelming influence on whether they are perceived as accented; in fact, any other accent factor will override the natural properties of pitch dominance in intervals. Graziano is certainly aware that context affects the strength of intervallic accents. Context is also important in any assessment of interacting accentual features. However, given the particular weakness of these factors within a musical environment, I do not believe that they should be considered as accentual at all. I can think of few scenarios where these pitches could be perceived as accented in a musical work without concurrent accent of another kind.

Lerdahl and Jackendoff determine that harmonic entities have accentual value. “By *structural accent* we mean an accent caused by the melodic/harmonic points of gravity in a phrase or section—especially by the cadence, the goal of tonal motion.”⁸ In a later discussion, they speak about the ways in which structural accents delineate the boundaries of formal sections: “The launching of a section, the return of a tonal region, or the articulation of a cadence can all have large-scale reverberations. Pitch-events functioning at such levels cause ‘structural accents’ because they are the pillars of tonal

⁷ John Graziano, *A Theory of Tonal Accent in the Classic-Romantic Period* (Ph.D. diss., Yale University, 1975), 23.

⁸ Fred Lerdahl and Ray Jackendoff, *A Generative Theory of Tonal Music* (Cambridge: The MIT Press, 1983), 17.

organization, its ‘points of gravity.’”⁹ While I agree in general with these statements, I prefer to distinguish between accent and gravitational qualities resulting from tonal organization. In my opinion, accent can only be experienced in time. The magnetic properties of tonality exist apart from time. Even so, in order for harmonies to receive accent, they must coincide with another accent factor. As with melodic intervals above, placement and context determine whether pitches or harmonies are perceived as accented. Alone, they do not possess the ability to create accent.

Carl Schachter agrees that the gravitational properties of tonality produce focus outside of a rhythmic environment. However, he believes that referential pitches revealed from reductional analysis *do* produce a *tonal rhythm*. He distinguishes between tonal rhythm, which is a result of rhythmic properties of the tonal system, and musical rhythm, which consists of durational patterns, accents and grouping.

(In tonal rhythm) the contrast between stable referential tones and the transitional ones produces an impression of patterned movement, in other words, an impression of rhythm. . . . This impression does not depend upon accentuation . . . Nor does it come from pulse or meter. The tonal rhythm persists through almost any conceivable pacing. . . . Tonal rhythm is most easily perceived where there is little or no durational patterning . . . in the same way, durational rhythm makes itself most strongly felt where the tones have little or nothing to do.¹⁰

The ideas set forth by Graziano, Lerdahl and Jackendoff and Schachter above are not universally accepted, even though there is precedent for these concepts in the works of much earlier theorists such as Rameau, Vogler, Sechter, Hauptmann and Riemann. Neither Joel Lester nor Wallace Berry accept tonal function as accentual. Berry states, “Although tonal function can support metric function. . . , it is in and of itself metrically

⁹ Ibid., 18.

¹⁰ Carl Schachter, “Rhythm and Linear Analysis: A Preliminary Study,” in *The Music Forum* 4, ed. by Felix Salzer (New York: Columbia University Press, 1976), 313-315.

neutral.”¹¹ While many theorists are unwilling to embrace fully a definition of accent that includes tonal function, most can agree to the seven accent-producing factors listed previously. This collection of accent factors is applicable to the music of any style period, and each component is supported in many other sources dealing with rhythm.

Timepoint Accents

In this study, I present specific rhythmic materials and compare them primarily by representing the accent structures that they contain. To provide details of rhythmic content at the foreground level, I have chosen to utilize accent in its most basic form—timepoint accent rhythm. Consider, for example, a segment of musical time with a perceived pulse. At each pulse (or timepoint), either a sound will be present or it will not. Those timepoints coinciding with sound are fundamentally “marked for consciousness” more so than those coinciding with silence. Furthermore, timepoints occurring with the *onset* of sound are emphasized more than those experiencing the continuation of a sound or silence. This set of assumptions forms the basis for this study.

A simple illustration will serve to reinforce the rhythmic prominence of pitch onset in the perception of a musical passage. Suppose that someone claps out the rhythm of a simple, familiar song and asks you to identify it. If the rhythm is accurately reproduced and you have a sense of the metric orientation, you will likely be able to identify the song. Consider the rhythmic stream notated below. Each “>” or “.” represents a point of time, and all points are evenly spaced. On each timepoint with “>” a pitch is initiated; each “.” represents a timepoint without pitch onset.

> . . > > . . > | > > > > . . . | > . . > > . . > | > > > > . . . |

¹¹ Berry, 330.

This excerpt from the opening of *Eine Kleine Nachtmusik* can be identified easily from attack points alone, without reference to pitch or duration. It should be apparent from this simple demonstration that the rhythm of pitch onset can stand out as the more prominent rhythmic element in a texture, defining the passage to a greater extent than durations.

The idea that pitch onset is rhythmically significant is well-supported. Joel Lester confirms its importance:

Accentuations arise from many different factors and occur in a virtually infinite range of strengths. The impulse that begins a note creates an accent in relation to the sustained portion of that note and the sustained portion of the preceding note (or to the silence that precedes the note)[A]ccents are caused by an event occurring in the music. These types of accents resonate in us as listeners by marking off points in time differentiated from those points that do not receive such impulses.¹²

In addressing the issue of inconsistencies in rhythmic precision in multiple performances of the same work, Eric F. Clarke also justifies the consideration of initiation points. Although his emphasis is quite different from my own, it is clear that he recognizes the predominance of pitch onset over duration and silence.

Changes of articulation (the continuum between legato and staccato) are also introduced in performance, affecting the relative proportions of sound and silence occupying the time-span of an event. Since the primary rhythmic property is the duration between event onsets, the relative proportions of sound and silence within time-spans are not considered to affect rhythmic properties directly.¹³

Onset is of primary importance in the analysis of rhythmic contours in Elizabeth West Marvin's article discussing the music of Edgar Varèse. She compares the durations of pitches in a given segment by observing their lengths in relationship to one another. In

¹² Joel Lester, "Notated and Heard Meter," *Perspectives of New Music* 24/2 (1986): 118.

¹³ Eric F. Clarke, "Levels of Structure in the Organization of Musical Time," *Contemporary Music Review* 2 (1987): 214.

an example with x pitches, each pitch is assigned a number from 0 to $(x - 1)$ according to its relative length; 0 represents the shortest duration and $(x - 1)$ represents the longest. Rests are not considered as separate entities; neither are they ignored. In the case where a segment contains a rest within a series of pitches, Marvin adds its durational value to that of the previous pitch.

In numbering (durations) from short to long, the determination is made from the onset of one (duration) to the onset of the next, regardless of whether the pitch in question extends through the entire temporal interval spanned or is interrupted by a rest.¹⁴

She goes on to give an example of two different rhythmic segments represented identically by her system. Attack point rhythm is the same in each instance, but durations differ. In essence, there is a level of equivalency established between duration and silence; as a result, onset stands out as more significant in the consideration of rhythmic content.

Characteristics of Groups

The preceding discussion confirms that accent can be caused by a number of factors and that it serves to emphasize a specific point or element in musical time. If accent is also to be understood as a *point of initiation*, then *what* it initiates is of significance. I noted earlier that the onset of a pitch is accented in comparison to its duration and to the duration or silence preceding it; therefore, any series of pitches can be considered a series of initiations. The *thing* that is initiated is a duration, and this duration lasts until the next pitch in the series is sounded.

¹⁴ Elizabeth West Marvin, "The Perception of Rhythm in Non-Tonal Music: Rhythmic Contours in the Music of Edgar Varese," *Music Theory Spectrum* 13/1 (1991): 66.

Accents may also serve as initiation points for groups. In this study, groups *must* be initiated by accent in order to be distinguished from surrounding materials. This does not imply that every accent in a texture initiates a group, but that group beginnings always coincide with some form of accent.

The subject of grouping has received a great deal of attention in the fields of psychology and music.¹⁵ Studies in music perception have contributed a great deal to our understanding of the ways in which listeners partition musical time. This increased understanding of grouping tendencies has provided researchers with an improved ability to predict the ways in which listeners tend to group musical materials, and it has suggested principles that theorists can use as a guide for segmentation on many levels.

Cooper and Meyer supply one of the earlier theoretical discussions on grouping and music. They speak generally, but provide insight into the manner in which we partition by discussing some of the factors that produce groups:

Grouping on all architectonic levels is a product of similarity and difference, proximity and separation of the sounds perceived by the senses and organized by the mind. . . . In general, sounds or groups of sounds which are similar (in timbre, volume, etc.) and near to each other (in time, pitch, etc.) form strongly unified rhythmic patterns. Difference and distance between sounds or groups of sounds tend to separate rhythmic patterns. However, though similarity tends to create cohesion, repetition usually makes for the separation of groups.¹⁶

The accent factors discussed earlier in this chapter can be applied to every grouping element cited by Cooper and Meyer. For example, if sounds can be grouped by similarity in timbre, volume, or pitch, then a change of timbre, volume or pitch could signal the beginning of a new group. This correlation between accent and grouping

¹⁵ Jeanne Bamberger's research has been particularly important, not only in understanding the manner in which listeners group, but also in demonstrating grouping's effect on rhythmic perception.

¹⁶ Cooper and Meyer, 9.

further supports the notion that accent-producing factors may function as the initiation points of groups.

Wallace Berry addresses more specific details of grouping. He defines it as the “partitioning of music’s time span by associations perceived within and among punctuated or articulated unit-orderings or events,” and identifies a number of factors causing musical segments to be grouped perceptually. In addition to those offered by Cooper and Meyer, Berry cites factors of textual influences as well as the grouping of essential pitches and their subsidiary tones, as may be observed in Schenkerian analysis.

Because of perceptual variance, there is always the likelihood that different listeners will hear and group passages differently. Cooper and Meyer rightfully contend that grouping is individually determined, affected by performance, and sometimes vague.

Rhythmic grouping is a mental fact, not a physical one. There are no hard and fast rules for calculating what in any particular instance the grouping is. Sensitive, well-trained musicians may differ. Indeed, it is this that makes performance an art—that makes different phrasings and different interpretations of a piece of music possible. Furthermore, grouping may at times be purposefully ambiguous and must be thus understood rather than forced into a clear decisive pattern. In brief, the interpretation of music—and this is what analysis should be—is an art requiring experience, understanding, and sensitivity.¹⁷

Recent studies reflect a different way of looking at grouping. Instead of speaking to the factors that cause grouping, emphasis is given to determining what qualities must be present for a musical unit to qualify as a group. Lerdahl and Jackendoff present a rather successful attempt at providing “hard and fast rules” for the determination of grouping, or in many cases the various reasonable options available for grouping in a given texture. In their book, they outline a comprehensive approach for determining

¹⁷ Ibid., 9.

groupings and structural delineation in a musical work. Their widely-referenced Grouping Well-Formedness Rules (GWFRs) are outlined as follows:

1. Any contiguous sequence of pitch-events, drum beats, or the like can constitute a group.
2. A piece constitutes a group.
3. A group may contain smaller groups.
4. If a group G1 contains part of a group G2, it must contain all of G2.
5. If a group G1 contains a smaller group G2, then G1 must be exhaustively partitioned into smaller groups.¹⁸

Grouping may be further refined by the application of Grouping Preference Rules (GPRs). These rules confirm structures that a listener can perceive by recognizing elements in a musical passage that most strongly affect the listener's perception.

Although I will not cite each rule here, I would like to call attention to GPR 1, which states: "Strongly avoid groups containing a single event," or in alternate form, "Avoid analyses with very small groups—the smaller, the less preferable." Even though I agree with this rule, there are several instances in Bartók's quartets where a single event is best considered as a group. In the analytical chapters that follow, some examples will include passages that contain musical blocks. In these blocks, related groups can appear multiple times during a passage, and in some instances they may contain only one chord or pitch. On these occasions, single-event groups are necessary for sensible segmentation and comparison.

¹⁸ Ibid., 31.

Grouping in Bartók's Quartets

As mentioned earlier, timepoint accent rhythm provides the basic materials for comparing rhythmic structures. Ultimately, even the most simple of these timepoint accent rhythms will segment into groups of consecutive accents or non-accents. I will refer to these groups as *Timepoint Accent Structures*. As with groups, these structures will be of varying lengths, will be initiated by accent, and could be grouped differently by different listeners. However, each structure will conform to most of the ideas and rules set out by authors noted above so that there is little room for the formulation of false relationships based on poor grouping tendencies.

Two grouping studies are particularly relevant to the analysis of Bartók's quartets. In their articles, Drake and Palmer, and Hutchison and Knopoff find temporal changes to play a primary role in the perception of musical groups, and most of the musical examples that I will present in later chapters are partitioned in this very manner. In the quotes presented below, their respective authors contend that alteration in duration, in one form or another, is the single, most important factor in the determination of grouping.

Rhythmic grouping segments a sequence on the basis of changes in event duration. A rhythmic group is a series of events separated from those surrounding them by temporal gaps (longer durations and/or pauses) Evidence from perceptual studies indicates that listeners segment sequences such that longer durations terminate rhythmic groups.¹⁹

We hypothesize that continuity of pattern, that is, the repetition of a note value or an increase or decrease in note values, is the intrinsic characteristic of the basic temporal unit of music; a break in pattern defines the termination of one unit and the beginning of the next. In this sense, we have used changes in temporal patterns to define temporal groupings in melody.²⁰

¹⁹ Drake and Palmer, 345.

²⁰ William Hutchinson and Leon Knopoff, "The Clustering of Temporal Elements in Melody," *Music Perception* 4/3 (1987): 284.

I have found that the many of groupings in Bartók's quartets coincide with or result from temporal changes, either in longer durations at a group's end or in the change of the basic note values.

Segmentation of Materials

Analytical examples in the chapters that follow will include segmentations limited to three possibilities only:

1. A single instrumental line
2. Multiple instrumental parts with homogeneous rhythm
3. Multiple instrumental parts functioning together as a unit, the most common example being an accompaniment pattern distributed between two or three parts

Composite rhythm is not the focus of this study and typically will not be considered in analytical examples, primarily because priority is given to the comparison of specific rhythmic materials. The study of a work's composite rhythm may provide information on the basic level of rhythmic activity, such as the total number of attacks encountered throughout various sections of a composition. However, little knowledge can be gained about specific rhythmic motives or cells when they remain embedded in composite rhythm. Wallace Berry validates the consideration of individual rhythmic streams in analysis:

[W]e apprehend rhythms as to individual streams of articulation, in interactions with other streams. Punctuations, changes, and projections of events of a particular class, as rhythmic articulations, group such events, partitioning time and thus expressing rhythm in identifiable durations; that is what rhythm is about . . . if we are to begin to comprehend the complexities of rhythmic experience we must regard accentual grouping

as distinct, observing that where different groupings are in alignment, they are of two streams concurring, and not a single thing.²¹

Berry implies here that individual rhythmic streams maintain their own identity, even within areas of non-parallel rhythmic activity. In the case where different streams sound concurrently, accentual grouping provides the means for segmentation. Kramer agrees that the interaction of different rhythmic layers should be addressed, but finds that substantive analysis of such has yet to take place.

One of the pitfalls in the analysis of rhythmic groups...is that no one has yet devised a viable method for studying simultaneously sounding groups that conflict. Yet much music is polyphonic. . . . The problem is not so much in delineating concurrent groups—that would be cumbersome on paper, but conceptually straightforward—but in explaining how they interact. Is a composite rhythm created? If so, how? Not only Lerdahl and Jackendoff but also Cooper and Meyer are aware of the challenge of polyphonic rhythmic groups, but neither team provides a viable method of analysis.²²

Although I also will not address issues dealing with the interactions of polyphonic rhythm, much can be gained by examining the organization, derivation and the development of individual rhythmic cells, motives and patterns within Bartók's quartets.

Considering Meter

One final topic must be addressed before proceeding to a discussion of methodology and analytical findings. Issues of meter have been disputed by many scholars over a number of decades. Benjamin (1984), Berry (1985), Lester (1986), and Rahn (1978) are among the numerous authors who have attempted to secure an understanding of the properties of meter. Although many have studied this topic, few agree on how meter might be best represented and understood. Christopher Hasty's

²¹ Wallace Berry, "Metric and Rhythmic Articulation in Music," *Music Theory Spectrum* 7 (1985), 30.

²² Jonathan Kramer, *The Time of Music* (New York: Schirmer Books), 112.

(1997) monumental work on the subject is perhaps the most thorough examination of the topic to date. Most sources discussing meter restrict analysis to tonal works, since twentieth-century compositions often lack perceived meter. Given the fact that Bartók's music is essentially metric, a case could be made for investigating the interaction of surface rhythms and meter. After all, syncopation and metric alterations are characteristic of his music, and an examination of these elements is bound to produce interesting results. In the analytical examples presented in chapters 4, 5 and 6, the metric layout of each rhythmic passage will often be included in the representation. As a result, individual measures may be considered as rhythmic units. While I will usually include barlines for diagramming and comparison, I will seldom address issues dealing with the interaction of rhythmic materials and meter.

Some believe that the overpowering effect of meter on a work's rhythmic content necessitates its consideration in the discussion of rhythm. However, Allen Forte considers the inclusion of meter in the discussion of twentieth century to be a hindrance.

I wish to make a general point concerning rhythm in early twentieth-century music. . . . (The rhythmic attack-release partition) supersedes or incorporates, if you will, the tonality-bound notion of metre, the concept of normative referential accent pattern, with its attendant terminology (e.g., 'structural downbeat'), which has hindered study of the rhythmic structure of this music for decades, just as the imposition of concepts of tonal harmony upon non-tonal music seriously inhibited its in-depth analysis in the early part of this century.²³

²³ Allen Forte, "Foreground Rhythm in Early Twentieth-Century Music," *Music Analysis*, 2 (1983): 247.

Conclusions

In summary, it is my intention to investigate the potential relationships that exist between particular rhythmic structures in the string quartets of Bartók. In doing so, I will utilize what I consider to be the most basic means of representation of these structures, specifically the accentual pattern produced by the onset of pitch. Accentual patterns will be evident in the oscillation of groups of consecutive accents and non-accents. Grouping and segmentation choices will result from my own intuitions but will conform to GWFRs and GPRs of Lerdahl and Jackendoff. Even though the exploration of metric and rhythmic interactions is appropriate to Bartók's music, it is not a necessary component in the discovery of relationships between rhythmic structures in these quartets.

CHAPTER 3

REPRESENTATION AND METHODOLOGY

A Case for Rhythm

Before embarking on the presentation of a system for rhythmic analysis, I will discuss my reasons for studying this musical element independently. In the last few years, the very process of music analysis has come under criticism, primarily because its focus is often limited to a single element, such as harmony, texture or form. Critics decry the lack of balance involved in analysis, citing a need to address the interaction of elements, the consideration of relevant historical information, and a broader style less attentive to seemingly insignificant details of construction. In discussing these issues, Joseph Kerman contrasts the respective weaknesses of musicologists and analysts:

For if the musicologists' characteristic failure is superficiality, that of the analysts is myopia. Their dogged concentration on internal relationships within the single work of art is ultimately subversive as far as any reasonably complete view of music is concerned. . . . Along with the preoccupation with structure goes the neglect of other vital matters—not only the whole historical complex, . . . but also everything else that makes music affective, moving, emotional, expressive.¹

Of course, analysis can reveal much more than Kerman suggests here.² Efforts toward understanding the organization of structural details in individual works are not frivolous. Consider the remarkable work that has gone into dissecting some of the most influential works of the 20th century, such as *The Rite of Spring*, *The Lyric Suite* and

¹ Joseph Kerman, *Contemplating Music: Challenges to Musicology*, (Cambridge: Harvard University Press, 1985), 73.

² In his chapter on analysis, Kerman later cites some of the more valuable and influential systems or styles of analysis in the 19th and 20th centuries. He does not fully condemn the analytical process, but finds that without proper balance its narrow focus too often renders meaningless results.

Bartók's *Fourth String Quartet*. The discovery of internal associations has been exciting, and for many researchers each find serves to further our understanding of organization in these pivotal works. Instead of providing all of the answers, analytical findings contribute bit by bit to a greater comprehension of the whole, whether the whole be a specific work, a composer's collection or a particular compositional style. No single analytical method can provide a complete understanding of musical content, but the search for consistency of design in one element alone is undoubtedly a worthwhile pursuit. Barbara Barry speaks to the ultimate value of well-wrought analysis:

[Analytical] techniques can also show, by means of segmentation and taxonomic procedures, the basic elements or 'building blocks' of a movement or work, how they are used in combination with other elements and how they contribute to the clarification of its large-scale formal divisions. Analysis can reveal relationships both at and beneath the surface of the music which might otherwise have been missed even in attentive listening, and so may show new relationships which can enrich understanding and appreciation of the work.³

My purpose in discussing these matters is to legitimize the extraction of rhythm in particular for analysis. Rhythm, more than any other element, appears to be inexplicably bound to other compositional elements. In a famous article written in praise of Stravinsky's rhythmic inventiveness, Benjamin Boretz proposes that rhythmic analysis is unnecessary.

The theory of rhythm, then, is nothing more or less than the theory of musical structure in its most comprehensive form. Yet the 'need' for an independent theory of rhythm can hardly be said to exist; for, since no musical theory can fail to be an at least partial rhythmic theory, every existing musical theory is in fact a contribution to the theory of rhythm. Moreover, there can be no useful general theory of rhythmic structure, since the particular disposition of functional events in different strata, over

³ Barbara Barry, *Musical Time: The Sense of Order* (Stuyvesant: Pendragon Press, 1990), 8-9.

differently overlapping and coinciding spans, is the most individual, the least ‘systematic,’ attribute of a composed musical structure.⁴

While I understand Boretz’s assertions, I do not agree that rhythm must be content to be addressed only within the context of methodologies not centered on rhythmic properties. If there is evidence of independent rhythmic design in the works of prominent composers through time, there is every reason to assume that the analysis of rhythm alone can provide insight into musical construction. Pierre Boulez called for the emancipation of rhythm for separate examination in music of the 20th century.

[A]t the very outset we should release rhythm from the ‘spontaneous’ direction that for too long has generously been attributed to it; that is to say, liberate rhythm from being, properly speaking, an expression of polyphony and move it up to the rank of a principal factor in the structure by recognizing that it can preexist polyphony—an idea that has as its aim nothing but linking still more closely, but much more subtly, polyphony to rhythm.⁵

Perhaps a reluctance to accept the independent analysis of rhythm stems from its novelty. Certainly, many new methods have met with some resistance in their early stages, but this alone is not justification for the dismissal of an approach. The more likely cause is the fact that we study a canon of music in which there is an interdependence of melody, harmony and rhythm. Outside of the boundaries of the common practice era, however, there are numerous examples of rhythmic approaches not limited to instinctive creation.

Two principal models of rhythmic autonomy can be found in pre-tonal music. The first may be seen in the utilization of rhythmic modes in the *clausulae*, *conductus* and early motets of the 13th century, in which notational restrictions prohibited a more

⁴ Benjamin Boretz, “In Quest of the Rhythmic Genius,” *Perspectives of New Music*, 10.1 (1971): 154.

⁵ Pierre Boulez, *Notes of an Apprenticeship*, trans. Herbert Weinstock (New York: Knopf, 1968), 145.

individualized organization of rhythm. The second is found in the isorhythmic motets of Machaut, Dufay and many others from 14th and 15th centuries; there is speculation that pitch design may have actually postdated rhythm in this compositional process. In these two models, rhythm is obviously very much a separate entity, it does not result from spontaneity, and it is undoubtedly precompositional. These factors greatly contrast the rhythmic approaches of common practice composers. In fact, Boulez claims that, “since the end of the Renaissance, rhythm has not been considered a peer of the other musical components. . . . [T]he best part of it has been left to intuition and good taste.”⁶

With the beginnings of atonal music and a freedom from the constraints of a hierarchical system of pitch ordering, a new level of experimentation with rhythmic content ensued. Boulez comments on his impression of rhythmic and harmonic developments in a select group of composers of the early 20th century:

[O]ne can determine, at the beginning of the twentieth century, a curious dissociation between the evolution of rhythm and that of sound-material: on the one hand, Schoenberg, Berg, Webern, points of departure for a new morphology and syntax, but related to a rhythmic survival. . . ; on the other hand, Stravinsky. At a half-way point there is Bartók alone. His sound researches never fall into the Stravinsky ruts, but they are very far from attaining the Vienna level; his rhythmic researches are very far from equaling Stravinsky's, but still, thanks to their folkloric backgrounds, they are generally superior to those of the Viennese.⁷

Of course, Boulez honors the rhythmic innovations of Stravinsky above all others, and I will agree that his influence is undeniable. Stravinsky's unique approach using rhythmic cells and block structures has had a tremendous effect on the musical community. There are, however, at least two other simultaneous trends in 20th century

⁶ Ibid., 143.

⁷ Ibid., 142.

rhythmic innovation that must be mentioned. The first is that of the serialization of rhythm. Nowhere is there a better illustration of rhythmic distinction than in those compositions where rhythm is serialized. Notable works utilizing this technique are Webern's *Variations for Piano*, op. 27 (1936), Babbitt's *Compositions for Four Instruments* and *Compositions for 12 Instruments* (1948), and Messiaen's *Mode de valeurs et d'intensités* (1949).

Another example of rhythmic independence in the 20th century is found in the compositional approach of Alban Berg. In his 'Open Letter' to Schoenberg, Berg speaks of the constructive role of rhythm in his *Chamber Concerto*:

Three rhythmic forms: a main rhythm, a subsidiary rhythm and a rhythm that can be considered as sort of a motive, are laid under the melody notes of the main and subsidiary voices. The rhythms occur with manifold variations—extended and abbreviated, augmented and diminished, in stretto and in reverse and in all imaginable metrical shifts and transpositions, etc.⁸

Berg identifies some of these rhythmic motives using the symbol *RH* to represent the term *Hauptrhythmus* in scores such as the *Chamber Concerto*, *Lulu*, and the *Violin Concerto*. "The angular and strongly syncopated nature of these patterns and Berg's practice of establishing them as self-sufficient rhythmic patterns before using them in association with thematic material. . . are usually amongst the distinguishing features of such *Hauptrhythmen*."⁹ Other unique rhythmic devices of Berg include a rhythmic canon for the fifth movement of the *Lyric Suite*, rhythmic series' of increasing or decreasing duration in *Lulu*, and tempo designations with numerological significance in the *Lyric Suite* and *Lulu*. These are not isolated instances of intensive rhythmic planning; in fact,

⁸ Willi Reich, *The Life and Work of Alban Berg*, trans. Cornelius Cardew (London: Thames and Hudson, 1965), 145.

⁹ Douglas Jarman, *The Music of Alban Berg* (Berkeley: University of California Press, 1979), 151.

Berg's works are permeated with these designs. Douglas Jarman finds no precedence for Berg's procedures in compositions of the 20th century: "To find rhythmic and durational techniques comparable to those used in Berg's music one must go back to the Renaissance composers—composers with whom, in this and other respects, Berg has much in common."¹⁰ Presumably, the Renaissance composers Jarman refers to are those who utilized isorhythmic procedures mentioned earlier.

In spite of the fact that there are noteworthy examples of deliberate, independent rhythmic organization on the part of a number of Bartók's contemporaries, I am not convinced that he customarily composed rhythm apart from pitch or contour. To be certain, there is evidence of conscious design in structures of progressive value (which will be discussed in chapter 5) and quite possibly in the proportions of large-scale structure. It appears, however, that Bartók does not treat rhythmic detail in the same rigorous fashion as does Berg, because structural rhythms do not saturate the texture of his compositions as they do with Berg. Instead, I believe that Bartók's approach to rhythmic materials is principally a consequence of the study of peasant music that at times possesses certain rhythmic characteristics also found in the quartets.

One of these characteristics is the use of isorhythms, and Bruno Nettl describes this approach with regard to the peasant music of Bartók's region:

Also common in Hungarian and some other Eastern European folk styles is the use of isorhythmic structure. . . . The meters may vary and the measures may have irregular numbers of beats, but the sequence of note values remains the same from line to line in this type of song. . . . [I]n most Eastern European styles of poetry it is not the number of accented syllables that is constant, but the number of syllables in toto. Thus, an isorhythmic arrangement, even if each phrase has several measures of

¹⁰ Ibid., p. 174.

different lengths, is better for accommodating the kind of line sequence that makes up the poetry.¹¹

Bartók is certainly aware of these properties, for he discusses them at length in his writings. He supplies detailed listings of rhythmic structures found in the peasant songs and categorizes these by the number of syllables in each line of text. He also confirms the presence of isorhythmic constructs in folk songs.

Another rhythmic characteristic of peasant music is the repetition and manipulation of motives or limited rhythmic materials within a given set of boundaries.

Bartók recognizes this attribute in some of Stravinsky's folk-influenced works:

[During] his 'Russian' period, [Stravinsky] seldom uses melodies of a closed form consisting of three or four lines, but short motives of two or three measures, and repeats them 'à la *ostinato*.' These short recurring primitive motives are very characteristic of Russian music of a certain category. . . . The steady repetition of primitive motives creates an air of strange feverish excitement even in the sort of folk music where it occurs. The effect is increased a hundred-fold if a master of Stravinsky's supreme skill and his precise knowledge of dynamic effects employs these rapidly chasing sets of motives.¹²

These short rhythmic motives are present not only in Russian peasant music but in Hungarian peasant music as well. Bartók discusses the utilization of specific, short rhythmic motives in various combinations in a particular type of rhythmic style found in the folk songs of Hungary:

[T]he so-called 'dotted' rhythm [is] especially characteristic for certain types of Hungarian rural music. Our dotted rhythm is a combination of. . . three rhythmic patterns. . . . Several combinations of [these] three patterns are possible and are in use.¹³

¹¹ Bruno Nettl, *Folk and Traditional Music of the Western Continents*, 2nd ed. (Englewood Cliffs: Prentice Hall, 1973), 87-88.

¹² Suchoff, 343.

¹³ Ibid., 384.

This combination and manipulation of rhythmic patterns or motives is a characteristic feature of Bartók's compositions, particularly in movements where *rigid* rhythm is present. As noted earlier, Bartók mentions this same trait in another essay and acknowledges its influence on his own music: "[I]n the melodies with a fixed dance rhythm the most curious, most inspiring rhythmic combinations are to be found. It therefore goes without saying that this circumstance pointed the way to altogether novel rhythmic possibilities for us."¹⁴

Eastern European peasant music is replete with examples of short rhythmic motives used in different combinations, and Bartók specifically refers to the influence of these patterns on his own writing. I will make note of these rhythmic structures and their repetitions and transformations in Bartók's formal compositions, and I will present a methodology for representing and comparing these structures.

Analytical Systems of Rhythm for 20th Century Music

Even though Christopher Hasty finds that "rhythmic analyses are generally vague, unsystematic and open to dispute,"¹⁵ there are certainly a few worthy of mention. Several analytical systems are appropriate for the study of rhythm in music of the twentieth century, and most of these have been designed to accommodate the special rhythmic features of contemporary music. I will cite four approaches and will comment briefly on the suitability of each for this study.

¹⁴ Ibid., 338.

¹⁵ Christopher Hasty, *Meter as Rhythm* (New York: Oxford University Press, 1997), 19.

Proportional Analysis and Rhythmic Contour

For a number of years, theorists have utilized proportional analysis in their discussions of sectional relationships in the works of Bartók. As mentioned earlier, Lendvai believes that the golden section and Fibonacci ratios are determinants of form in selected works, and some researchers have applied these same concepts to other elements of structure. For example, Tibor and Peter J. Bachmann have found similar types of proportional relationships in durational strings, scales, and harmonies in Bartók's music.¹⁶

Jonathan Kramer has also discovered proportional significances in music of the 20th century. Using block structures, such as those discussed by Edward Cone and Pieter van den Toorn, Kramer compares the lengths of timespans represented by these blocks and finds continuity in the recurrence of proportional relationships in the works of Stravinsky. These block structures are actually addressed as *moments*, a term first used by Stockhausen to describe a type of music consisting of independent, adjacent musical segments free of directed motion. Kramer elaborates:

Moments are defined as self-contained entities, capable of standing on their own yet in some sense belonging to the context of the composition. . . . If moments are defined by internal consistency, it follows that they can be of any length (practically speaking, from a few seconds to several minutes). Thus proportions are indeed important in moment-form pieces. . . . [T]he nature of moment form suggests proportional lengths of moments as the one remaining principle of formal coherence.¹⁷

Although proportional analysis is appropriate to the study of form in Bartók's works, its application to foreground rhythm analysis seems less fitting. Even though

¹⁶ Tibor Bachmann and Peter J. Bachmann, "An Analysis of Béla Bartók's Music Through Fibonacci Numbers and the Golden Mean," *Musical Quarterly*, 65/1 (1979): 74-80.

¹⁷ Jonathan Kramer, "Moment Form in Twentieth Century Music," *Musical Quarterly*, 64 (April 1978): 181-2.

Bachmann and Bachmann discuss the proportions of some isolated foreground rhythms, the tediousness of such an approach in comparing many rhythmic units in a composition is prohibitive.

Elizabeth West Marvin's system of rhythmic contours, which I mentioned briefly in chapter one, is somewhat similar to proportional study in that it cites relationships between all pitch durations in a given unit. Unlike proportional design, these relationships are imprecise; however, this technique is much more manageable in the study of specific rhythms and is particularly valuable in music that is neither metered nor pulsed. Marvin's premise is that our perception of time shifts more toward the general comparison of durational lengths in music that is void of metric regularity. Although rhythmic contour analysis can logically be applied to almost any type of music, Marvin finds it to be less appropriate for metrically-based compositions, because perceived meter influences rhythmic perception to the degree that a listener is less likely to proportionally compare basic durations. Even though Bartók's works are primarily metric, the application of rhythmic contour analysis to his block-type structures can elucidate his general manner of organizing such materials. Analytical examples appropriate for rhythmic contour will be presented in chapter five.

Attack-Release Partitions

In two articles from the 1980s, Allen Forte presents a flexible method for comparing pitch durations in twentieth century music. His focus is on foreground rhythmic materials and his analyses are based on an attack-release partition, which is essentially an uninterpreted string of integers representing the consecutive durations of sounds and rests. Figure 3.1 shows the attack-release partition for the first two measures

Figure 3.1: Attack-Release Partition for *Eine Kleine Nachtmusik*

Generative Rhythmic Structures

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detail regarding the intensive cellular or motivic treatment of rhythm, with many of the same kinds of transformations that are present in the works of Bartók. A discussion of generative rhythmic structures is also found in *Notes of an Apprenticeship*, in which Pierre Boulez provides an interesting analysis of certain passages from *The Rite of Spring*. Although Stravinsky's rhythmic approach appears to be less methodical than Berg's, Boulez finds substantial motivic manipulation of rhythm in his analysis.

Even though Jarman and Boulez address the same types of devices that are also found in Bartók's music, they present no analytical system in either of these studies. While each author is able to discuss his findings clearly without an analytical methodology, there are obvious benefits to devising a system that can reveal transformations and relationships not apparent without such a system.

Time Circles and Time Cycles

In a recent article in *Music Theory Online*, Willie Anku discusses the rhythmic design found in some types of African music, describing these rhythms in terms of *time cycles* and *time circles*. Anku represents rhythmic streams by placing their consecutive durations on a circle in clockwise fashion. While one or more performers provide a steady metric base, the *master drum* "projects a succession of intriguing, logically ordered rhythmic manipulations which are concurrently regulated by the common timing principle of the time cycle."¹⁸ This time cycle is essentially a set from which all material for a performance is derived, and the master drummer may metrically shift the set, use different sets successively, use subsets and supersets, and interpolate one set within

¹⁸ Willie Anku, "Circles and Time: A Theory of Structural Organization of Rhythm in African Music," *Music Theory Online*, 6.1 (January 2000), 3.

another. Figure 3.2 contains Anku's diagram of a time cycle for a particular rhythm stream.

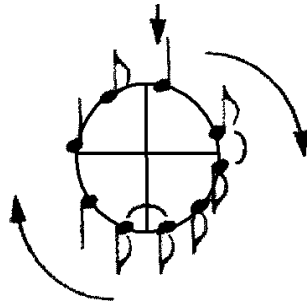


Figure 3.2: Time Cycle of a Pattern in African Music¹⁹

Rotational relationships are easily identified with this type of representation, and retrograde is realized by moving around the cycle in reverse order. Relationships of complementation, augmentation and diminution are more difficult to determine from this diagram, however. This particular representational approach could be very helpful in visualizing some of the cellular transformations of rhythm in the music of Bartók, but, as stated earlier, my preference is for the extraction of timepoint attack rhythm and a system that allows for the recognition of structures grouped by consecutive timepoint attacks and non-attacks.

Possible Systems of Representation for Timepoint Accent Rhythms

There are at least three possibilities for delineating timepoint accent rhythms in a manner that will allow for ease in recognition of related structures. Before presenting

¹⁹ Ibid., Figure 1.

these systems, let me summarize the qualifications I feel are necessary for the representation and comparison of these rhythms:

1. Each rhythmic unit is most clearly defined by the onset of sounds in that unit, as discussed in chapter two. Bartók's rhythm is predominantly characterized by an underlying perceptual pulse and is often metric. To present timepoint accent rhythm in a pulsed environment, each successive pulse must be shown to correspond with an attack or non-attack. Throughout this study I assume that timepoints and pulses will typically represent the smallest duration in any given passage, even though alternate possibilities may exist in many cases.
2. Segmentation will provide rhythmic structures to be compared. Each structure will naturally group into series of consecutive attacks and non-attacks. The ability to clearly see this grouping is a necessary component for determining the patterns and relationships of these groups.
3. Groups can relate by means of repetition, rotation, retrograde, complementation, augmentation, diminution, expansion, contraction, and fragmentation.
4. Other types of patterning may also be present, such as symmetry and arithmetic/geometric progressions.

Timepoint Circles

The first method of representation for timepoint accents is actually an altered form of Anku's time cycle diagram seen above. Rather than placing specific durations on the circle, the diagram may be modified to resemble a pie chart, with each segment representing discrete timepoints. For each timepoint receiving an attack, the

corresponding segment on the chart is shaded, and each timepoint without an attack is left unshaded. The two measures of *Eine Kleine Nachtmusik* appear in timepoint circle form in Figure 3.3.

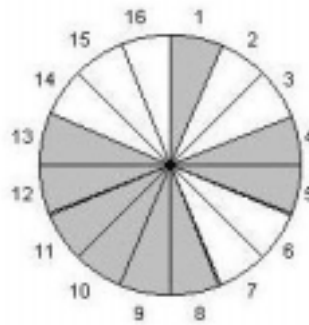


Figure 3.3: Timepoint Circle for ms. 1-2 of *Eine Kleine Nachtmusik*

Rotation is easily recognizable with this type of diagram. As with Anku's circles, retrograde rhythm is accomplished by reversing direction. Complementation results in the opposite shading of the diagram's individual segments. Groups of consecutive attacks and non-attacks are fairly easy to see. Less obvious in this type of diagram however are patterns of symmetry, arithmetic/geometric progressions, augmentations and diminutions; these features would become more immediately apparent if grouping were represented numerically.

Timepoint Sets

Timepoint accent information may also be placed in set form, where the numbered location of each timepoint that receives an attack is listed in the set. Figure 3.4 provides a timepoint set for measures 1-2 of *Eine Kleine Nachtmusik*.

The total number of timepoints present throughout the span of the set is t and the durational value of each timepoint for that particular set follows as $:x$. Figure 3.4 contains the timepoint set representation of the same segment from *Eine Kleine Nachtmusik* used in previous examples. The example spans a total of 16 timepoints, each timepoint has the value of an 8th note, and those timepoints receiving pitch onset are listed as members of the set.

$$[1, 4, 5, 8, 9, 10, 11, 12, 13]:8, t=16$$

Figure 3.4: Timepoint Set for ms. 1-2 *Eine Kleine Nachtmusik*

There are numerous advantages to this approach. Rotation simply involves the addition of a single number to each member of the set, mod- t ; the number chosen indicates the number of places (timepoints) the entire pattern will be rotated.

$$[1, 4, 5, 6, 7, 8, 10, 11, 12, 13] + 2 = [3, 6, 7, 8, 9, 10, 12, 13, 14, 15]:8, t=16$$

Figure 3.5: Rotation 2 of the Timepoint Set for *Eine Kleine Nachtmusik*

Retrograde is calculated by subtracting each member of the set from $(t+1)$, mod- t and reordering the set numerically, as demonstrated in figure 3.6.

$$17 - [1, 4, 5, 8, 9, 10, 11, 12, 13] = [16, 13, 12, 9, 8, 7, 6, 5, 4]$$

$$\text{reordering of set entries} = [4, 5, 6, 7, 8, 9, 12, 13, 16]:8, t=16$$

Figure 3.6: Retrograde of Timepoint Set for *Eine Kleine Nachtmusik*

If a particular set surfaces in analysis with different timepoint values represented, it is apparent that augmentation or diminution has occurred or that the set is present at hypermetric levels. In figure 3.7, the timepoint value has changed from 8th notes to quarter notes, indicating augmentation of the original set found in Figure 3.4

$$[1, 4, 5, 8, 9, 10, 11, 12, 13]:4, t=16$$

Figure 3.7: Augmentation of Timepoint Set for *Eine Kleine Nachtmusik*

Complementation in this design is accomplished by listing the numerical entries not present in the original set. This enables more complete analysis, in that the pattern of non-attack sequences can be studied independently. This proves particularly valuable when a composer exchanges timepoint sets and their complements within a composition.

$$[2, 3, 6, 7, 14, 15, 16]:8, t=16$$

Figure 3.8: Complement of Timepoint Set for *Eine Kleine Nachtmusik*

Timepoint Accent Structures

Both timepoint circles and timepoint sets have the potential to demonstrate various types of relationships between rhythmic streams and cells. Timepoint circles are visually compelling and timepoint sets offer a feasible approach for analyzing generative structures. Yet one necessary element lacking in these designs is the accumulation of successive timepoints of attacks and non-attacks into groups. By numerically grouping these consecutive timepoint attacks or non-attacks together in a representational system, patterns of symmetry or arithmetic progression sometimes emerge. In addition, seeing the entire succession of both attack and non-attack groups concurrently can reveal

interesting patterns that are the result of the interactions between these two types of groups; timepoint sets and circles above do not adequately represent these interactions. Because it is essential to be able to discern potential patterns resulting from grouping, I have chosen to represent these structures in a manner conducive to grouping analysis. The following example provides such a representation:

ags:	1	2	6	3		:8
non-ags:		2	2		3	

Figure 3.9: Timepoint Accent Structure for *Eine Kleine Nachtmusik*

In this type of delineation, hereafter referred to as the *Timepoint Accent Structure* (TAS), the upper strand represents groups of successive timepoints receiving attacks and the lower strand denotes groups of consecutive timepoints without attacks. Groups of timepoint attacks will be referred to as accent groups (*ags*), because each pitch onset is actually a type of accent, as noted in chapter 2. Consequently, groups of consecutive non-attacks will be called non-accent groups (*non-ags*).²⁰ As with timepoint sets above, the number following the colon at the end of the structure indicates the durational value of each timepoint, which is typically the pulse or the shortest duration of the passage. Noting the total number of timepoints is unnecessary here, however, because each timepoint is accounted for in one of the two strands. This simple design enables one to see each kind of relationship recognized with timepoint circles and timepoint sets. For

²⁰ The decision to designate these structures as *accent groups* allows for the flexibility of application to other types of grouping that are not the result of consecutive timepoint attacks. This issue will be clarified in analytical examples found in chapter 5.

example, complementary relationships are noted by the positional exchange of the two strands, as demonstrated in Figure 3.10.

ags:		2	2	3		:8
non-ags:	1	2	6	3		

Figure 3.10: Complement of TAS for ms. 1-2 of *Eine Kleine Nachtmusik*

Augmentation and diminution associations reveal themselves in the same manner as with timepoint sets—the timepoint value for the structure changes to a different duration. Rotation is also easily identified with this particular design. It is sometimes necessary, however, to place the TAS in a more compressed form in order to view these relationships, and the excerpt in Figure 3.11 provides a means for demonstrating this compression. Taken from the measures 5-6 of *Eine Kleine Nachtmusik*, the TAS for this two-measure fragment is as follows:



ags:	1	1	6	3		:8
non-ags:		1	2	2		

Figure 3.11: Excerpt and TAS for ms. 5-6 of *Eine Kleine Nachtmusik*

The TAS in 3.11 both begins and ends with *ags*. Adding these outer numbers together further compacts the structure and results in the following TAS, which is actually a rotation of the original:

$$\begin{array}{rcll} \text{ags:} & & 1 & 6 & 4 \\ \text{non-ags:} & 1 & 2 & 2 & \parallel \parallel :8 \end{array}$$

Figure 3.12: Compression/Rotation of TAS for ms. 5-6 of *Eine Kleine Nachtmusik*

The TAS method differs from timepoint circles and timepoint sets in that the compression of structures, as seen in 3.12, conceals the true ordering of rhythmic groups. It is necessary to present each TAS in compacted form, but retaining the original, non-compressed form of each is recommended as well. There are many examples in the literature of rhythmic streams that are stated, repeated and transformed, and it is common for cells from these rhythmic streams to assume independent significance. The recognition of the relationships of these cells to their original streams may be lost if the stream is only presented in compacted form. Ultimately, the prime form of a TAS should also include barlines.

None of the systems mentioned in this chapter incorporates barlines in its representation, because it is often presumed that metric notation of 20th century music is a matter of convention and has little effect on rhythmic perception. Joel Lester remarks on this phenomenon:

In short, the rhythmic notational system that our century has inherited from the tonal era, and that is fully capable of depicting graphically the perceived effect of an extraordinarily broad range of rhythmic subtleties in tonal music, may very well be misleading us in our attempts to understand the rhythmic effects of much recent music.²¹

²¹Lester, “Notated and Heard Meter,” 125.

Carl Dahlhaus explains the notational difficulties facing composers of the 20th century:

A rhythmic technique the principles of which are new instead of merely enriching older forms leads to problems of notation. The composer has the problem either of changing the notational system or of the reverse, namely expressing rhythmic phenomena in a notation which, by virtue of the historical meaning it has acquired, contradicts that which is to be conveyed.²²

In a discussion regarding the metrical displacement of repeated material in the *Danse Sacrale*, Dahlhaus further states, “The musical significance of this (change of metrical placement) suggests that the time signatures, being interchangeable, mean nothing; they are in fact irrelevant. The barlines are not markings of stress, but merely a method of ordering the notes.”²³ Although many scholars would certainly agree with these statements, it is interesting to note that Stravinsky himself, who was aware of these contradictions of notation and perception, confirmed the status of the barline in his discussions with Robert Craft: “The barline is much, much more than a mere accent, and I don’t believe that it can be simulated by an accent, at least, not in my music.”²⁴ He also spoke of the difficulties he encountered with conductors’ interpretations and the barline:

The character of articulation in my music eluded most of the conductors, even in so simple a point as that the metrical lines are constituent to the rhythm, not mute, inglorious markers which the conductor is invited to ignore for the sake of something he calls the phrase.²⁵

I agree that very often rhythmic and metric perceptions, particularly in the music of Stravinsky and Bartók, conflict with notation; however, this does not suggest that metric notation should be altogether ignored. Frequently, these composers notate many

²² Dahlhaus, 46.

²³ Ibid., p. 48

²⁴ Igor Stravinsky and Robert Craft, *Conversations with Stravinsky* (Berkeley: University of California Press, 1959), 21.

²⁵ Igor Stravinsky and Robert Craft, *Retrospectives and Conclusions* (Berkeley: University of California Press, 1959), 43.

changes of meter within a short period of time, and this in itself is evidence that the placement of barlines is not haphazard, accidental, or simply a matter of convenience. I believe that if a composer has chosen to utilize barlines, the consideration of their locations as delineators of musical materials can provide insight into structure. As a result, I will often include barlines in each TAS--the decision to do so will result in the least-compacted form of a TAS structure, or what I consider to be the *true prime form*. Consequently, each TAS could take as many as three different forms, dependent on whether *ags* and *non-ags* straddle barlines. To illustrate, I will once again return to the notated version of measures 5-6 from *Eine Kleine Nachtmusik*, followed by the three forms of its TAS, designated as *true prime form*, *non-metric form*, and *most-compressed form*, respectively. These structures are found in Figure 3.13.



The musical notation shows two measures of music. The first measure contains a quarter rest, a quarter note, a half note, and a quarter note. The second measure contains a quarter note, a half note, a quarter note, and a quarter note. The notes are G4, A4, B4, and A4.

ags:	1 1 3 3 3 :8	} true prime form
non-ags:	1 2 3 2 3 :8	
ags:	1 1 6 3 :8	} non-metric form
non-ags:	1 2 2 3 :8	
ags:	1 6 4 :8	} most-compressed form
non-ags:	1 2 2 4 :8	

Figure 3.13: Three forms of the TAS for ms. 5-6 of *Eine Kleine Nachtmusik*

The consideration of all three types of TAS structures, when available, will provide a greater number of options for comparing structures and will allow rhythmic

materials to be viewed in the context of streams and the fragments of these streams, commonly referred to as *cells*.

In addition to those relationships noted above, there are other types of patterns that may be found in the rhythmic materials of Bartók, such as symmetrical structures and those that exhibit arithmetic or geometric progressions. Rhythmic transformations involving expansion, contraction, exchange and fragmentation also take place. Though less often, individual strands in the TAS may occur independently in a texture. Each of these circumstances will be presented in analytical examples found in chapters 4, 5 and 6.

CHAPTER 4

CELLS, STREAMS AND THEIR CONNECTIONS

Bartók's Use of Cells in the Construction of Pitch Materials

As I mentioned in a previous chapter, cellular procedures of pitch structuring in the works of Bartók have been acknowledged for quite some time. Milton Babbitt's recognition of two prominent, generative intervallic cells in the *String Quartets* in a 1949 article¹ prompted an array of further articles and books by other authors both confirming his findings and expanding his ideas into extensive theories regarding Bartók's pitch systems. In this article, Babbitt noted two specific intervallic sets that Bartók utilized extensively in the quartets, and George Perle later designated these sets as *X* and *Y* cells². In Figure 4.1, the *X* cell appears horizontally in the cello part in the opening measures of the first movement of the *Fourth Quartet*; it is represented by the set {0, 1, 2, 3}. The *Y* cell is found distributed vertically in all voices on the downbeat of the measure; it is represented by the set {0, 2, 4, 6}.

In 1959, Leo Treitler identified another significant intervallic unit that he designated as the *Z* cell. This particular intervallic structure occurs very often, not only in the works of Bartók but also in other 20th century works, such as the *Lyric Suite* by Alban Berg. The *Z* cell in Figure 4.2, also extracted from the *Fourth Quartet*, movement 1, is represented by set {0, 1, 6, 7} and is found in the 1st violin part.

¹ Milton Babbitt, "The String Quartets of Bartók," *Musical Quarterly* 25 (July 1949): 377-85.

² George Perle, "Symmetrical Formations in the String Quartets of Béla Bartók," *Music Review* 16 (November 1955): 300-312.

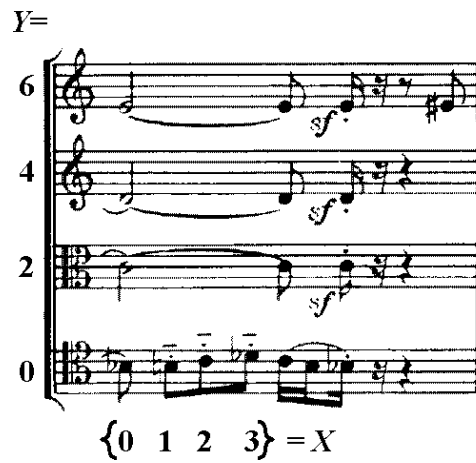


Figure 4.1: X and Y cells found in the *Fourth Quartet*



Figure 4.2: Z cell found in the *Fourth Quartet*

The importance of X, Y, and Z cells becomes apparent in the analyses of Perle and Antokoletz. The latter speaks not only of the ubiquitousness of these cells but also their interrelatedness to other pitch and interval structures and their influence on large-scale design. The following is a compilation of our current knowledge of pitch cell structures and their role in the music of Bartók:

1. X, Y and Z cells appear in many forms throughout the quartets, and the *Fourth Quartet* contains perhaps the greatest concentration of these cells and their transformations. The process of composition by cellular organization had been explored by Bartók in previous compositions, but it found its most mature form in the *Fourth Quartet*.
2. X, Y, and Z cells are symmetrical and cyclical. X is a cycle-1 set, and this means that each pitch in the set is separated by the interval of a half-step. All pitches in the Y cell are separated by a whole-step, so it is a cycle-2 set. Z consists of two cycle-6 sets separated by a half-step. These basic features are compositionally exploited within the *Fourth Quartet*.
3. Shared subsets of the cells are musically highlighted.
4. Typical transformational processes are utilized, such as inversion, retrograde, expansion and segmentation.
5. Cells sometimes progress to like cells by their own interval. They also *progress* from one to another. This technique will be clarified and discussed in chapter five.

I have presented this information on pitch cells to provide a foundation for the discussion of rhythmic cells. I will demonstrate that the same kinds of processes applied to pitch construction in the quartets may also be found in rhythmic construction. In the remainder of this chapter, I will present excerpts from three different quartets, discussing rhythmic content in a manner that parallels cellular pitch analysis.

The Fourth Quartet, Movement 5

Perhaps the most clear and consistent examples of cellular rhythmic design are found in ostinato passages of the quartets. While pitch and other musical elements remain consistent in these passages, the rhythmic content alone changes. These ostinatos appear in some form in all of the string quartets and many other notable works, such as *Allegro Barbaro*. Most contain a basic 8th note pulse and occur in 2/4 meter. An excellent example of Bartók's ostinato rhythmic treatments is found in the *Fourth Quartet*, fifth movement, hereafter referred to as IV/5. I will be specifically discussing the content of measures 1-89 which is presented in its entirety in Figure 4.3 below.

Connections Between Arab Folk Elements and Ostinato Patterns

János Kárpáti notes specific instances where Bartók uses folk elements in the *Fourth Quartet*, and some of these elements have a direct bearing on both melodic and ostinato patterns found in IV/5. He cites definite associations between the fifth movement's ostinato pattern and the drum accompaniments found in some Arab folk music.

In Bartók's music the presence of Arab folk music elements is frequently accompanied by drum effects. In North African Arab and Berber folk music—vocal and instrumental alike—drum accompaniment has an important function. The percussion instruments used in these areas (bandir, tabal) have one feature in common in that the player can produce sounds at two or three different pitch levels. The metrical character of the rhythmic patterns they produce is consequently influenced by the stress (dynamic) and the pitch (colour) together. Bartók's interest was attracted not merely by the primitive, barbaric ostinato rhythm of the percussion instruments, but by the frequent appearance of virtuosic polymetrics between melody and accompaniment, or even within the drum accompaniment itself.³

³ Kárpáti, 102

Allegro molto, ♩ = 152

5

10

15

20

A

A

A

B

C

ff

sf

simile

ff marc.

marc.

Figure 4.3: Introduction and Ostinato from ms. 1-89 of IV/5

25

A B

30

IV-
ff marc.

C B2 D E

35

marc.

E D

40

E B A

Figure 4.3: Introduction and Ostinato from ms. 1-89 of IV/5 (cont.)

The musical score is divided into four systems, each containing four staves (Violin I, Violin II, Viola, and Cello/Double Bass). The key signature is G major (one sharp) and the time signature is 3/4.

- System 1 (Measures 70-74):** Features a continuous sixteenth-note melody in the Violin I part. Dynamics include *mf cresc.* and *f*. Rehearsal marks I, J, and A are indicated below the staves.
- System 2 (Measures 75-79):** The Violin I part continues with a similar texture. Dynamics include *ff* and *mf*. Rehearsal marks J and E are indicated.
- System 3 (Measures 80-84):** The Violin I part features a *f marc.* (forte marcato) texture. Dynamics include *f marc.* and *mf*. Rehearsal marks E and D are indicated.
- System 4 (Measures 85-89):** The Violin I part continues with a *marc.* texture. Dynamics include *ff* and *mf*. Rehearsal marks A and J are indicated.

Figure 4.3: Introduction and Ostinato for ms. 1-89 of IV/5 (cont.)

In the ostinato of IV/5, rhythmic patterns of the type mentioned by Kárpáti are indeed produced by dynamic stress, but pitch changes generally have little bearing on these rhythmic patterns. For example, in measures 12-43 of Figure 4.3, two instruments supply the melodic materials in unison or octaves, while the remaining two voices act together to provide the ostinato. In the ostinato voices, one instrument plays an open fifth (C – G) in constant 8th notes while the other voice plays an augmented 3rd (Db – F#) at various intervals. Deviation from these pitches takes place only at the transition points immediately prior to measures 31 and 44. Rhythmic patterns in this passage result from the accents produced by the intermittent sounding of the augmented 3rd and concurrent *sf* marks and grace notes, but they are not a result of pitch change. This configuration is typical of many other ostinatos found in Bartók's music.

The presence of Arab folk materials is apparent in the ostinato passage in IV/5. Figure 4.4 contains an accompaniment pattern from the Biskra collection, which is found in Bartók's Arab music publication.

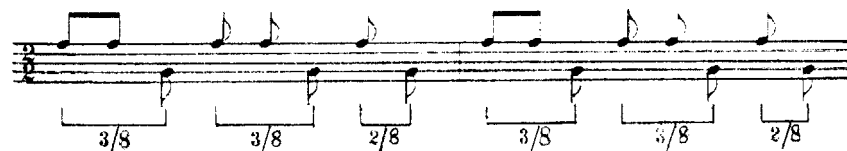


Figure 4.4: Accompaniment pattern found in Bartók's Arab publication

This accompaniment pattern consists of two measures in 2/2 meter, each with an internal grouping succession of 3/8, 3/8 and 2/8. According to Kárpáti, this pattern, which is also typical of some of the rhythms found in the Bulgarian songs in his folk

collections, is a source of rhythmic inspiration for Bartók, and this is particularly evident in the *Fourth Quartet*.

I do not wish to explain every similar metrical technique in Bartók's music through the influence of Arab music, but there can be no doubt that the drum imitation accompanying the Arab-like melody of the *Fourth Quartet* acquired its asymmetrical emphasis as a result of the influence of the Arab metre type quoted above [Figure 4.4]. A better example of the pairing of characteristic Arab melody and rhythm can scarcely be found in all of Bartók's works.⁴

In the majority of cases, patterns in the ostinato passage from IV/5 do in fact group into units of two or three 8th notes, though not consistently in the order found in the Arab accompaniment pattern above. The 3, 3, 2 pattern does not appear in exact form in IV/5, but closely-related cells are plentiful in the passage.

While I concur with the affiliation of this ostinato with the Arab meter type, I take issue with Kárpáti's idea that this technique is fundamentally metric. The perception of 2/2 meter in this passage is not somehow replaced by consecutive bars of 3/8, 3/8 and 2/8. Instead, these groups of two and three beats are still understood within the context of 2/2 meter. Perhaps a more plausible view considers the accents in the texture to be points of initiation for groups rather than metric downbeats. This idea is strongly supported by the fact that Bartók notated the Arab accompaniment himself in 2/2 meter rather than notating it with changing meters of 3/8, 3/8 and 2/8.

Rhythmic Cells Present in the Ostinato

I have chosen to subdivide the ostinato of IV/5 into segments of two measures. This segmentation is based primarily on the rhythmic content of the ostinato itself. In the first six measures, a two-bar rhythmic pattern is repeated three times in succession. This

⁴ Ibid., 103-104.

establishes a fundamental framework for the ostinato and causes the listener to anticipate similar segmentation in the measures that follow.

Ten distinct two-measure units are found within the ostinato passage of measures 12-89, and these will be referred to as cells A-J. Figure 4.5 contains a chart that includes information on each cell, such as the measure location of its first occurrence, the prime and compressed forms of its TAS, and some of its relationships to other cells within the passage. Each cell on the TAS chart is also bracketed and identified in the score found in Figure 4.3. Referring to both will help clarify any questions that may arise as to TAS content and segmentation.

In previous discussions, *Timepoint Accent Structures* (TAS) represented the locations of pitch onset within a passage with a perceived pulse; however, they may denote any type of accent in a musical segment. The ostinato of IV/5 clearly contains a consistent 8th note repetition (its pulse), but this element alone provides no real sense of patterning. As a result, the TAS is derived from the onset of the augmented 3rd dyads which correspond with grace notes and *sf* markings in the open 5th dyads in measures 11-43. In measures 44 and following, the augmented 3rd dyad is no longer present, but the pattern of accent continues to be maintained by the grace notes and *sf* markings, except in bars 72-74. In these measures, the D# pitches of the 1st and 2nd violins, which were sounded concurrently with *sfs* in the previous bars, provide the pattern of accent.

I have deliberately accounted for only two forms of the TAS for each cell in the chart: prime form and most-compressed form. Non-metric form, that is the TAS prime form with barlines removed, was not included in this example because, with the

exception of cell *J*, the same TAS is manifest in each non-metric form and most-compressed form.

The ostinato cells of IV/5 are found to be highly interrelated when the TAS for each is considered. For example, most cells are related to *A* by rotation, and this feature is easily seen by comparing the most-compressed forms of the TAS. Cells *A*, *C*, *D*, *E*, *F*,

Measures of 1st occurrence	Cell	TAS Prime Form	TAS Compressed Form	Relationships
12-13	A	$\begin{array}{cc cc} 1 & & 1 & 1 \\ 1 & 2 & 2 & \end{array}$	same	
18-19	B	$\begin{array}{cc ccc} 1 & & 1 & 1 & 1 \\ 1 & 2 & 1 & 1 & \end{array}$	$\begin{array}{ccccc} 1 & 1 & 1 & 1 \\ 1 & 3 & & 1 \end{array}$	shared subsets: A1=B1
22-23	C	$\begin{array}{cc ccc} 1 & & 1 & 1 & 1 \\ 1 & 2 & 1 & 1 & \end{array}$	$\begin{array}{ccccc} 1 & 1 & 1 & & \\ 2 & & 1 & 2 & \end{array}$	rotation of A, C1=A1 B2 and C2 are complements
31-32	D	$\begin{array}{cc cc} 1 & 1 & 1 & \\ 1 & 1 & 1 & 2 \end{array}$	$\begin{array}{ccccc} 1 & 1 & 1 & & \\ 1 & 2 & & 2 & \end{array}$	rotation of A, D2=A1 D1=C2
33-34	E	$\begin{array}{cc cc} 1 & 1 & 1 & \\ 2 & & 1 & 2 \end{array}$	same	rotation of A measure exchange with A
50-51	F	$\begin{array}{cc cc} 1 & 1 & 1 & \\ 1 & 1 & 2 & 1 \end{array}$	$\begin{array}{ccccc} 1 & 1 & 1 & & \\ 1 & 2 & & 2 & \end{array}$	rotation of A, F1=B2 retrograde of C
52-53	G	$\begin{array}{cc c} 1 & 1 & 1 \\ 2 & & 3 \end{array}$	$\begin{array}{ccc} 1 & 2 & \\ 2 & 3 & \end{array}$	G1=A2 G2 is unique
54-55	H	$\begin{array}{cc ccc} 1 & & 1 & 1 & 1 \\ 2 & 1 & 1 & 1 & \end{array}$	$\begin{array}{ccccc} 1 & 1 & 1 & 1 \\ 2 & 2 & & 1 \end{array}$	rotation of A measure exchange with F
56-57	I	$\begin{array}{cc cc} 1 & & 1 & \\ 2 & 1 & 1 & 2 \end{array}$	$\begin{array}{ccccc} 1 & 1 & & & \\ 2 & 2 & 2 & & \end{array}$	symmetrical set I2=A2
70-71	J	$\begin{array}{cc cc} 1 & 1 & 1 & \\ 2 & & 2 & 1 \end{array}$	$\begin{array}{ccccc} 1 & 1 & 1 & & \\ 2 & 2 & & 1 & \end{array}$	rotation of A retrograde of A

Figure 4.5: TAS Chart for the Ostinato Cells in IV/5

H , and J are all rotations of the same rhythmic structure. As mentioned previously, a form of the Arab folk pattern of 3/8-3/8-2/8 is found in this ostinato. The Biskra accompaniment pattern in Figure 4.4 has a most-compressed TAS of $2_1 2_1 1_1$, which is a complement of the A cell and all of those that are rotations of A .

Several cells share subsets in this ostinato passage, and these relationships are apparent in the comparison of prime forms of the TAS. Recall that the this prime form retains barlines, and these barlines act as boundaries for the further fragmentation of cells into smaller units. These barlines may or may not be aurally perceived as accurate, but the composer nonetheless included them to function as delimiters of some type. In this and other examples to follow, I will designate the subsets of the TAS prime forms with a superscript corresponding to its measure number in the cell, such as A^1 or A^2 .

Three primary subsets are present in this passage, and they first occur as A^1 , A^2 and B^2 respectively. With the exception of G , every cell in the ostinato is comprised of a combination of two of these three cells. The subset content of each cell is listed below:

A	=	A^1	+	A^2
B	=	A^1	+	B^2
C	=	A^1	+	B^2 (rotated)
D	=	B^2 (rotated)	+	A^1
E	=	A^2	+	A^1
F	=	B^2	+	A^1 (rotated)
G	=	A^1	+	G^2
H	=	A^1 (rotated)	+	B^2
I	=	A^1 (rotated)	+	A^1
J	=	A^2	+	A^1 (rotated)

Figure 4.6: Subset Content of Each Cell of IV/5

Not only is there a remarkable degree of connectedness in the basic construction of these cells; other associations by complementation, retrograde and exchange by measure may be observed as well. Some of these relationships are noted in Figure 4.5. In addition to the transformations cited above, there are also four separate examples of fragmentation and elision in the ostinato passage. In each instance they coincide with section endings. Before citing the locations of these structures, let me first discuss sectionalization within this example. Measures 12-89 can be logically segmented into 5 larger sections, and these sections consistently correspond with a change of pitch or register in the ostinato pattern. The five sections and their distinctions are identified as follows:

Section 1:	ms. 12-30	Ostinato is shared between viola and cello
Section 2:	ms. 31-43	Ostinato is shared between 2 nd violin and viola
Section 3:	ms. 44-67	Ostinato returns to viola and cello and its pitch content changes
Section 4:	ms. 68-74	Bridge-like passage where augmented third is gone and rhythmic pattern is transferred to motive in upper voices
Section 5:	ms. 75-89	Pitch content changes again and ostinato is distributed throughout the voices

The ostinato in each of these sections contains a distinct series of rhythmic cells. This cell *progression* occurs in the following order:

Section 1:	$A - A - A - B - A - C - A - B - C - B^2$
Section 2:	$D - E - E - D - (E + B)$
Section 3:	$A - A - C - C - F - G - H - I - E - E - E - E - E$

Section 4: $I - J - (A+J)$

Section 5: $\text{Block} - E - \text{Block} - E - D - \text{Block} - (A+J)$

Elision and fragmentation occur at the end of sections 1 2, 4 and 5. The first example of fragmentation occurs in measure 30 where subset B^2 is presented without B^1 . Cell C immediately precedes B^2 in measures 28-29, and B^2 is a mirror image of C^2 . These adjacent cell fragments create a symmetrical two-measure closing to the first ostinato section.

$$C2 + B2 = \left| \begin{array}{ccc} 1 & & 1 \\ & 1 & \\ & & 1 \end{array} \right| \left| \begin{array}{ccc} & 1 & \\ 1 & & 1 \\ & 1 & \end{array} \right| :8$$

Figure 4.7: Symmetrical TAS Produced by Adjacent Subsets of $C2$ and $B2$ Cells

An example of elision is found in measures 39-41, where sets E and B overlap. It is interesting to note that these two measures contain all three primary subsets of the ostinato.

$$E + B = \left| \begin{array}{ccc} 1 & & 1 \\ & 2 & \\ & & 1 \end{array} \right| \left| \begin{array}{ccc} & 1 & \\ 1 & & 2 \\ & 1 & \end{array} \right| \left| \begin{array}{ccc} & 1 & \\ 1 & & 1 \\ & 1 & \end{array} \right| :8$$

Figure 4.8: Elision of E and B Cells

At the closing of sections 4 and 5, in measures 72-74 and 87-89, cell A is elided with cell J . The product of this elision is a three-measure TAS pattern with symmetrical content, as seen in Figure 4.9. This three-measure unit can also be considered as an elision of A with its own retrograde.

$$A + J = \left| \begin{array}{cc} & 1 \\ 1 & 2 \end{array} \right| \left| \begin{array}{cc} 1 & 1 \\ 2 & 2 \end{array} \right| \left| \begin{array}{cc} 1 & 1 \\ 2 & 1 \end{array} \right| :8$$

Figure 4.9: Symmetrical TAS resulting from Elision of Cells *A* and *J*

One additional rhythmic connection should be noted in this passage. The introduction, found in measures 1 – 11, contains the TAS stream in 4.10 in the upper three voices.

$$\begin{array}{cccccc} 8 & 2 & 2 & 3 & 2 & \\ & 1 & 1 & 1 & 1 & 1 \end{array} \left\| :4\right.$$

Figure 4.10: TAS of Upper Voices in the Introduction, ms. 1-11

Obvious subset connections exist between this rhythm stream and the ostinato cells discussed above, but another interesting feature is present. Notice that each entry in the lower strand of 4.10 is *1*. This indicates that timepoints without pitch onset occur only in isolation. By contrast, all cells in the ostinato cells of 4.5 contain *1* in each entry in the *upper* strand, indicating that each pitch onset occurs singly. This contrast provides a sharp distinction between the introduction and the ostinato that follows, while at the same time a degree of similarity exists because of cellular connections between the two. The general *reversal* of strands demonstrates that the process of complementation can apply not only to specific rhythms but also to the basic rhythmic concept behind a particular passage.

The *Second Quartet*, Movement 2

In his article on Bartók's quartets, Perle discusses the significant role of the Z cell throughout these works, and he cites II/2 as a good example of its widespread use throughout the movement.

The key to greater structural coherence of the *Second Quartet* is found in the basic cell . . . (This cell) is not only, and sometimes not at all, a motivic detail, but also a structural unit of a more fundamental type, to which Bartók was to return to in the *Fourth Quartet* and which is a primary referential element in some of the best-known works of the so-called atonal school . . . the basic cell is something more than a means of thematic association . . . (it) plays a more obvious role in (the second) movement than it does in the others.⁵

A basic *rhythmic* cell is also found in II/2, and it functions as a primary referential element in much the same way as the Z cell. This rhythmic cell takes many forms: it is rotated, reversed, complemented, expanded, augmented, and diminished. It is also found embedded within ostinato patterns and rhythmic streams or framing such patterns or streams. Significant structural points in the movement often correspond with statements of the basic rhythmic cell. In essence, this rhythmic configuration saturates the entire movement, affecting melodic entities, ostinatos, motivic figures, accompaniment patterns and hypermetrical units. The TAS for this cell is 1^3 and because of its structural role in II/2, I will subsequently refer to it as the S cell.

Figure 4.11 contains the opening of II/2, which begins with an 11-measure introduction containing a 7-bar passage in unison or octaves followed by a 4-bar statement of the ostinato that continues into the next section. Theme 1 is presented in the

⁵ George Perle, "The String Quartets of Béla Bartók," In *A Musical Offering: Essays in Honor of Martin Bernstein*, ed. Edward H. Clinkscale and Claire Brook (New York: Pendragon Press, 1977), 198-199.

Allegro molto capriccioso (♩ = 160)

pizz. arco (♩ = 192) **1**

ritard. **2** a tempo

Figure 4.11: Introduction and Theme 1 of II/2

The musical score is divided into four systems, each with a grand staff (treble, alto, and bass clefs).

- System 1:** Features a melody in the treble clef with accents and a forte (*sf*) dynamic. The bass clef has whole rests.
- System 2:** The treble clef melody includes a *ritard.* (ritardando) and a 3-measure *accel.* (accelerando) section. Dynamics include *mf* (mezzo-forte). The bass clef continues with whole rests.
- System 3:** Marked *al - - tempo* with a tempo indication of a quarter note = 192. It includes *cresc.* (crescendo) markings in both staves, *arco* (arco) in the treble, and *f pizz.* (forte pizzicato) in the bass.
- System 4:** Starts with a 4-measure section. Dynamics include *dim.* (diminuendo) in the treble and *dim.* in the bass. The treble clef has *ff* (fortissimo) and *sf* (sforzando) markings. The bass clef has *p* (piano), *ff*, and *pizz.* markings.

Figure 4.11: Introduction and Theme 1 of II/2 (cont.)

succeeding measures and is found in the 1st violin part between rehearsal numbers 1 and 4.

Theme 1 is divided into three sections, beginning with rehearsal numbers 1, 2 and 3 respectively. The TAS for each of these sections is presented below as Theme 1a, 1b and 1c. Notice that only three basic cell types occur: those with a 4 as the only entry, those with consecutive 1s, and those with 3s and 1s.

$$\begin{array}{l}
 \text{1a: } \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| :8 \\
 \text{1b: } \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| :8 \\
 \text{1c: } \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| :8
 \end{array}$$

Figure 4.12: TAS for Theme Segments 1a, 1b and 1c of II/2

Sections 1a and 1b are identical except for measures 2 and 3, where $1 \quad 3$ replaces 4 in each of these measures in section 1b. Sections 1a and 1c have the first five measures in common, but the latter extends the pattern by repeating the last cell five more times before coming to a conclusion.

The *S* cell opens sections 1a, 1b and 1c, and it also initiates the second half of sections 1a and 1b. Its retrograde closes the first half of 1a and 1b in the 6th measure of each. Some form of the *S* cell either initiates or frames each section or subsection of the first theme in II/2.

13 **Sostenuto.** (♩ = 100) **a tempo** (♩ = 160)

The first system of the musical score consists of four measures. The first measure is marked **Sostenuto.** with a tempo of 100 (♩ = 100). The second measure is marked **a tempo** with a tempo of 160 (♩ = 160). The music is written for four staves (Violin I, Violin II, Viola, and Cello/Double Bass). The first measure features a **feoppr.** (ferocious) marking and a **f** (forte) dynamic. The second measure features a **pizz.** (pizzicato) marking and a **p** (piano) dynamic. The third measure features an **arco** (arco) marking and a **f** (forte) dynamic. The fourth measure features a **pizz.** (pizzicato) marking and a **p** (piano) dynamic. The music is in 2/4 time and features a key signature of one sharp (F#).

Figure 4.13: Musical Excerpt from II/2

The TAS for the basic melodic materials in measures 1-4 of this excerpt is found in Figure 4.14. This rhythmic material is duplicated in measures 5-8, and repeated with alteration and expansion in measures 9ff. Because 16th notes appear in the passage, the basic pulse value of the TAS is 16. Obviously, this rhythmic stream is closely related to that of Theme 1 for the movement (ex. 4.12). Some form of the *S* cell appears four times in these measures: the first and second measures contain three complements of the *S* cell, and in measure three *S* is found in the center of the cell. As in 4.12, 4 is adjacent to *S*

cells, and the final measures of these streams in most cases contain consecutive *I*'s in each strand.

$$\left| \begin{array}{cc} 1 & 1 \\ & 3 \end{array} \right| \left| \begin{array}{cc} 1 & 1 \\ & 3 \end{array} \right| \left| \begin{array}{ccc} 1 & 3 & 1 \\ & 1 & 1 \end{array} \right| \left| \begin{array}{ccc} 1 & 1 & 1 \\ & 1 & 1 \end{array} \right| :16$$

Figure 4.14: TAS for Basic Melodic Materials in 4.13

Other means of segmentation are appropriate for this passage. For example, the chords in the lower voices of measures 1 and 2 in 4.12 contain a separate rhythm that can legitimately be singled out for discussion. The TAS for this chord rhythm is the first structure presented in Figure 4.15, and in this case the pulse is represented by a quarter note. In addition, the melodic material of the passage may be represented differently if one perceives certain pitches in a stream as more accented. For instance, I consider the most prominent melodic material in measures 1-4 to be D# - E - Eb in measures 1-3 of the first violin; in my opinion, the melodic material that follows these notes may be considered a separate entity because of a change in character, tempo, dynamic, articulation and register. Since this rhythm represents perhaps the most conspicuous of the melodic material, its rhythmic structure should be considered for comparison. Its TAS is the second structure in Figure 4.15.

$$\left| \begin{array}{cc} 1 & 1 \\ 1 & 2 \end{array} \right| \left| \begin{array}{cc} 1 & 1 \\ & 3 \end{array} \right| :4$$

$$\left| \begin{array}{ccc} 1 & 1 & 1 \\ 1 & 1 & 3 \end{array} \right| :4$$

Figure 4.15: TAS for Chord Rhythm and Melody in 4.13

Connections between the first theme and the passage represented by the TAS structures in 4.14 and 4.15 are obvious in that many shared subsets and cell transformations exist, even when multiple segmentations of the same passage are considered and pulse values in the TAS differ.

Figure 4.16 contains a three-measure segment in which the ostinato is comprised of two different rhythmic cells occurring simultaneously. The 1st and 2nd violins are accented on the downbeat of each measure because of the repeated initiation of the motive and dynamic stress. The resultant TAS for each measure is $1\ 3$, which is of course the *S* cell. In the cello part, the representative TAS may be derived either from the accent mark on the downbeat or from the pattern produced by pitch onsets. If the accent marks are used, the TAS for each measure is the *S* cell, but if pitch onsets are used the TAS becomes $1\ 1\ 2$. If this cell is placed in most-compressed form, the result is the unordered TAS $3\ 1$, which is a complement of the *S* cell.



Figure 4.16: Ostinato Pattern in II/2 beginning in the 4th ms. after reh. 7

The $1\ 1\ 2$ cell of 4.16, which I'll refer to as the T cell, also occurs in rotated form at rehearsal 11 in the next example. Figure 4.17 includes an ostinato passage between rehearsal 11 and 12 where the 2nd violin provides a pattern of rhythm. The TAS for this passage is found in 4.18. Although a rotation of T is present in 4.18, cell $1\ 2\ 1$ appears much more often. This cell is neither a rotation nor a complement of cell $1\ 1\ 2$ but is instead an example of an *exchange* relationship, where one member of a strand exchanges locations with a member of the opposite strand. An exchange of the numbers 2 and 1 from cell $1\ 2\ 1$ produces cell $2\ 1\ 1$, which is a complement of T . Cell $1\ 2\ 1$ will now be referred to as U .

Before going forward with additional comparisons, let me state the three significant cells found thus far in II/2 and assign labels to two others not previously discussed:

$$\begin{aligned}
 S &= 1\ 3 \\
 T &= 1\ 1\ 2 \quad (\text{rotation of } S) \\
 U &= 1\ 2\ 1 \quad (\text{exchange of } T) \\
 V &= 1\ 1\ 1\ 1 \\
 W &= 4
 \end{aligned}$$

Although I have not cited cells V and W until now, they have been present in each of the examples for II/2 discussed above. Cells S , T and U are more significant because of their prevalence and also because of their interrelatedness. Cells V and W are not

arco

11

gliss.

pizz. arco

f

gliss.

mf

sf

cresc. sf

cresc.

mf cresc.

sf cresc.

12

sf

sf

sf

sf

Figure 4.17: Ostinato Pattern in II/2, reh. 11-12

2 1 | 1 2 | 1 1 | 1 2 | 1 1 | 1 2 | 1 2 | 1 2 | 8

Figure 4.18: TAS of 2nd Violin in Ostinato of 4.17, rehearsals 11-12

transformations of the *S* cell, as *T* and *U* are, but they appear frequently in the examples and must therefore be recognized.

An interesting situation can be observed in Figure 4.19 beginning with reh. 24 and continuing well beyond the measures presented. The TAS for this stream is presented in 4.20 and contains cells related to *T* by rotation or complementation. Measures 1 and 2

The musical score is presented in three systems. The first system, starting at rehearsal mark 24, is marked 'poco allarg. al - (♩ = 152)'. It features a treble and bass staff with various notes and rests, including a measure with a boxed '24'. The second system is marked 'acceler.' and contains several 'sf' (sforzando) markings. The third system is marked '(♩ = 168)' and continues the musical notation. The score includes various musical notations such as notes, rests, and dynamic markings.

Figure 4.19: Tutti Section in II/2, reh. 24ff.

$$\left| \begin{array}{c} 2 \\ 1 \end{array} \right| \begin{array}{c} 1 \\ 1 \end{array} \left| \begin{array}{c} 1 \\ 2 \end{array} \right| \begin{array}{c} 2 \\ 1 \end{array} \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \begin{array}{c} 2 \\ 2 \end{array} \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \begin{array}{c} 2 \\ 1 \end{array} \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| :8 \right.$$

Figure 4.20: TAS for Tutti in 4.20

are repeated in measures 3 and 4. Then, beginning in measure 5, cell $\begin{array}{c} 2 \\ 1 \end{array} \begin{array}{c} 1 \\ 1 \end{array}$ is presented in continuous statements. Even though an accent mark is notated at each downbeat, the agogic accent on the second 8th note of each measure eventually causes the perception of the downbeat to shift to that note. Although this repeated cell is notated throughout as $\begin{array}{c} 2 \\ 1 \end{array} \begin{array}{c} 1 \\ 1 \end{array}$, the perception is that of a rotated version of this cell, $\begin{array}{c} 1 \\ 1 \end{array} \begin{array}{c} 2 \\ 2 \end{array}$.

Figure 4.21 contains the score for another ostinato segment found in II/2. The lower voice is a form of theme 1. The upper voice of measures 1-3 contains an expanded complement of the *S* cell, and this is demonstrated by the TAS in 4.22. Note that the pulse value in the TAS is the 16th note, which differs from the 8th note pulse in most previous examples.

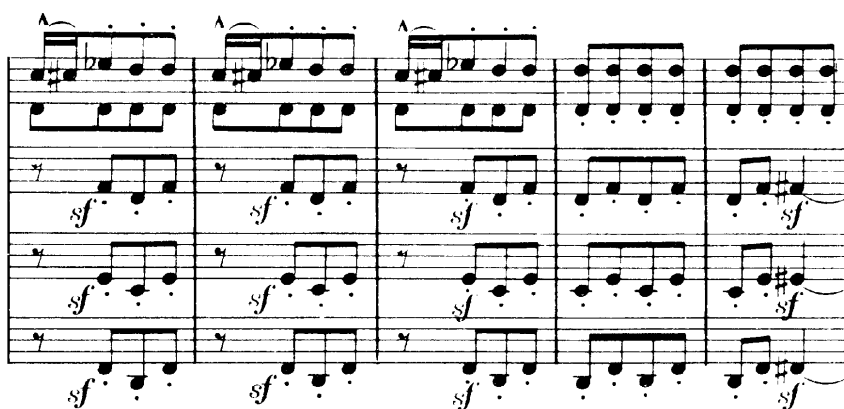


Figure 4.21: Ostinato Pattern in II/2

$$\left| \begin{array}{cccccc} 3 & & 1 & & 1 & \\ & 1 & & 1 & & 1 \end{array} \right| :16$$

Figure 4.22: TAS for Ostinato in 4.21

I mentioned earlier in this chapter that cells could appear at various points in the quartets with differing pulse values, thus resulting in augmentation or diminution of these timepoint structures. In the previous example, 16th note pulses actually represent a diminution of the original pattern. Augmentation of a pattern can occur at numerous levels as well.

Figure 4.23 includes a series of measures with cells that relate to *S* and *T*, both of which occurred first with an 8th note pulse. The 12-measure passage that begins with the last measure of the first staff contains cells in hypermeter that correspond to cells previously found at the pulse (8th note) and subpulse (16th note) levels. The accent patterns in this passage are derived from the presence or absence of a chord on the downbeat of each measure. Figure 4.24 contains the TAS for this section, and the *pulse* in this case is the half-note, which is equivalent to the length of one measure.

The composite rhythm of this passage is quite similar to that of theme 1, noted above in Figure 4.12. When the 16th note is used as a pulse, all cells resulting from the composite rhythm within this stream are either complements of *S* or direct statements of *W*, as seen in the four-measure fragment represented in Figure 4.25. Although these passages might at first appear to be quite different, similarity in rhythmic content is discovered when comparing these structures using TAS analysis.

$$\begin{array}{cccc} 3 & 3 & 1 & 2 \\ 1 & 1 & 1 & \end{array} \parallel :2$$

Figure 4.24: TAS for Hypermeter Cells in 4.23

$$\left| \begin{array}{cc} 1 & 4 \\ 3 & \end{array} \right| \left| \begin{array}{cc} 1 & 4 \\ 3 & \end{array} \right| \left| \begin{array}{cc} 1 & 4 \\ 3 & \end{array} \right| \left| 8 \right| :16$$

Figure 4.25: TAS for the Composite Rhythm of 4.23

Another illustration of hypermetrical cells is found in Figure 4.26, and this excerpt is noticeably similar to Figure 4.23. Beginning at the *a tempo*, two cells related to *S* and *T* by rotation are presented. The TAS for these cells is located in 4.27, and they are configured by determining a hypermetrical pulse of *I* for each measure.



Figure 4.26: Cell Patterns in Hypermeter in II/2

$$\begin{array}{cccc} 3 & & 2 & 1 \\ & 1 & & 1 \end{array} \parallel :1 \text{ measure}$$

Figure 4.27: TAS for Hypermeter Cells in 4.26

The final example from II/2 is taken from the last three measures of the movement. Figures 4.28 and 4.29 contain these final measures and their TAS representation. The *S* cell, which I touted as the generative rhythmic structure earlier in the chapter, is now emphasized by *ff* octaves at the close of the movement. The *S* cell and its complement, which were used to frame segments of theme 1, now appear adjacent to one another without intervening musical materials. I consider the presence of this cell at this significant point in the movement to be confirmation of the importance of its structure, which is not only defined by pitch but by the rhythmic content as well.

Sostenuto molto.

The musical score is for four staves in 4/4 time. The first two staves have a 'ff' dynamic marking. The third and fourth staves have a '1' marking. The score is in 4/4 time and consists of four measures. The first measure has a half note on G4 and a half note on E4. The second measure has a half note on G4 and a half note on E4. The third measure has a half note on G4 and a half note on E4. The fourth measure has a half note on G4 and a half note on E4.

Figure 4.28: Final Measures of II/2

$$\left| \begin{array}{cc} & 3 \\ 1 & \end{array} \right| \begin{array}{cc} 1 & \\ & 3 \end{array} \Bigg| :8$$

Figure 4.29: TAS for Final Measures in 4.28

The *Fifth Quartet*, Movement 5

The fifth movement of the *Fifth Quartet* has much in common with II/2, particularly in the rhythmic processes it employs. Both movements are primarily in 2/4 with an 8th note pulse, and both contain thematic and ostinato materials that utilize related rhythmic cells. I will provide only a brief discussion of V/5, noting representative examples of the same types of procedures already cited in the analysis of II/2.

Figure 4.30 includes material from the first theme of the movement, found in octaves in the 1st and 2nd violins, which I have segmented into two sections for discussion. The first segment occurs in measures 18-25 and the second segment is found in mm. 26ff. The TAS for the first segment is found in Figure 4.31, and it reveals a repeated 4-bar pattern that is comprised of cells *U*, *S*, and *W*—the same cells noted in II/2. Figure 4.32 contains the second segment of theme 1, and it consists of cells *S* and *W*. The whole of the first theme is constructed almost exclusively of the same cells found in theme 1 of II/2 (Figure 4.12).

A short ostinato pattern coincides with theme 1 in V/5. This ostinato, whose accent pattern is a result of the simultaneous sounding of dyads in the viola and cello parts, is basically a repeated two-measure pattern that first occurs in measures 18-19 of Figure 4.30. The TAS for this ostinato is found in Figure 4.33, with both prime and most-compressed forms of the structure represented. This ostinato contains cells *U* and *V*

in alternation and is similar in content to the ostinato of II/2 noted in Figure 4.18. It is also closely related to the ostinato cells of IV/5, found in the chart of Figure 4.5; although it is not a duplication of one of the cells found in the chart, the subset content is defined by $\{A^2 + B^2(\text{rotated})\}$.

Figure 4.30: Theme 1 of V/5, ms. 17-33

$$\left| \begin{array}{c} 1 \\ 2 \end{array} \right| \left| \begin{array}{c} 1 \\ 3 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 2 \end{array} \right| \left| \begin{array}{c} 1 \\ 3 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| :8$$

Figure 4.31: TAS for Melodic Material in First Segment of Theme 1, ms. 17-25

$$\left| \begin{array}{c} 1 \\ 3 \end{array} \right| \left| \begin{array}{c} 4 \\ 3 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 4 \\ 3 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 3 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 3 \end{array} \right| :8$$

Figure 4.32: TAS for Melodic Material in Second Segment of Theme 1, ms. 26-33

$$\left| \begin{array}{c} 1 \\ 2 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| :8 = \begin{array}{c} 1 \\ 2 \end{array} \begin{array}{c} 2 \\ 1 \end{array} \begin{array}{c} 1 \\ 1 \end{array}$$

Figure 4.33: TAS for Ostinato in Theme 1, ms. 18-24

The next example is taken from a developmental segment that manipulates rhythmic materials from the first theme of V/5. The pitch content of theme 1 (Figure 4.30) and this development (Figure 4.34) are not similar, but rhythmic structures are related because they are composed almost exclusively of sets *S* and *W*. This becomes obvious by comparing the TAS segments for this excerpt (Figure 4.35) and that of the segments of theme 1, found in Figures 4.31 and 4.32.

A more striking correlation exists between the TAS cells of this developmental section and the thematic material of II/2 found in Figure 4.12. As seen in the TAS of 4.35, the developmental section of Figure 4.34, mm. 348-366, is divided into three sections, parsed by the two-measure rests notated in the score. Figure 4.13 also contains three distinct sections. These two excerpts, which are very different in character and musical content, have the following rhythmic elements in common:

1. All three sections of each example are initiated by cell *S*.
2. Each example contains consecutive statements of *W*.
3. *W* is present in original and complement forms.

4. S and its transformations frame segments in each example.

The musical score is divided into four systems, each containing four staves. The first system (measures 348-351) is marked "Poco sost." and "ff". The second system (measures 352-355) is marked "a tempo" and "strepitoso". The third system (measures 356-359) is marked "360" and "2". The fourth system (measures 360-363) is marked "360" and "2". The score shows various rhythmic patterns, including eighth and sixteenth notes, and rests. The key signature has one sharp (F#).

Figure 4.34: Development of Rhythmic Materials in Theme 1 of V/5, ms. 348-366

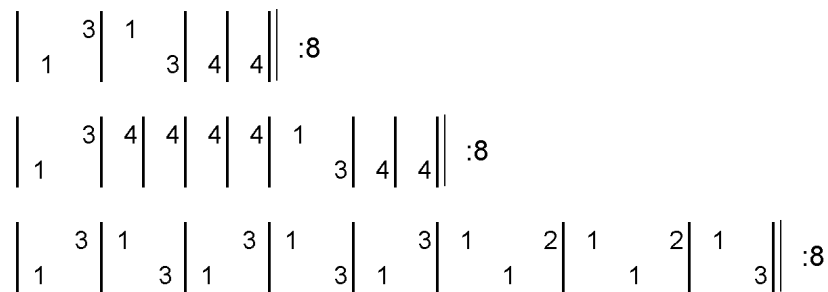


Figure 4.35: TAS for Each of the Three Segments in Ex. 4.34

Figure 4.36 demonstrates the layering of significant cells found throughout the fifth movement, and these are continuously repeated within an ostinato pattern. With the 8th note as a pulse, the TAS for 1st and 2nd violins in each measure is $1 \quad 3$. The TAS cells for viola and cello are $1 \quad 3$ and $1 \quad 1 \quad 2$ respectively. These *S* and *T* cells are also used in the layered ostinato pattern from II/2 seen in Figure 4.16.



Figure 4.36: Ostinato with Layering of Prominent Cells in V/5, ms. 369-372

A hypermetrical rhythm is produced by the presence or absence of pitches on the downbeat of each measure in Figure 4.37. The TAS pattern for this structure is found in Figure 4.38, and its pulse is the half note. This TAS and the one that represents an ostinato pattern from mm. 18-24 (Figure 4.33) are identical. Even though the pitch, contour, texture, range, articulation and dynamics of these excerpts are completely different, the basic rhythmic structure of the two is precisely the same.

Figure 4.37: Hypermetrical Passage in ms. 150-157

$$\begin{array}{ccccccc} 1 & & 1 & & 2 & & \\ & 1 & & 2 & & 1 & \end{array} \parallel :2$$

Figure 4.38: TAS for Hypermeter Pattern in 4.37

Figure 4.39 contains the final measures of movement V/5. As with II/2, these concluding measures present the most significant rhythmic cells of the movement. In

addition, these *S* and *W* cells occur in measures set apart from the rest of the movement by rests, change in tempo and *ff* dynamics. The TAS for the last three measures of this segment is found in Figure 4.40.



Figure 4.39: Final Measures of V/5

$$\left| \begin{array}{c} 1 \\ 3 \end{array} \right| \left| \begin{array}{c} 4 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 3 \end{array} \right| :8$$

Figure 4.40: TAS for Final Measures in 4.39

Conclusions

A number of tentative conclusions may be drawn from the examples from IV/5, II/2 and V/5 presented in this chapter:

1. Generative rhythmic structures are found in the ostinato movements. These structures take many forms and often appear in prominent locations.

2. Rhythmic cells are manipulated in the same manner as pitch cells.
Complementation and rotation are the most common transformations, but retrograde and exchange relationships are also found.
3. Prominent rhythmic cells may occur at both hypermetrical and subpulse levels.
This is equivalent to augmentation and diminution and is represented by a change in the basic pulse value of a TAS.
4. Musical passages that appear to be highly dissimilar may in fact be closely related in rhythmic design.
5. Melodic passages in these movements contain a high percentage of *S*- and *W*-related cells (that is, $1\ 3$ and 4 cells). As a result of this basic cell content and the patterning of these cells, thematic materials in these ostinato movements are remarkably similar.
6. Ostinato passages tend to consist primarily of *T*-, *U*- and *V*-related cells (that is, $1\ 1\ 2$, $1\ 2\ 1$, and $1\ 1\ 1\ 1$ cells). Ostinato patterns in various movements of different quartets are closely related to one another.
7. Cell and stream connections may cross over into many elements of structure, such as thematic materials, accompaniment patterns, ostinati, introductory passages, developmental sections, etc.

In almost every example noted in this chapter, the basic pulse is the 8th note and the meter is 2/4. Given these parameters, a limited number of rhythmic cells is possible within the span of a single measure. When the chosen method of analysis for these cells examines timepoint attack rhythm (such as TAS) rather than durational content, the

potential number of distinct rhythmic cells is further diminished. In this scenario, using TAS analysis, only 16 different ordered cells exist, and many of these cells are related by transformational processes. Of the 16 possible rhythmic combinations, Bartók uses 14 consistently; the remaining 2 cells are also used, but they appear infrequently. These seldom-used cells are 2^2 and 2^2 .

In an environment with such limited rhythmic possibilities, the potential for drawing relationships between *any* two cells or streams exists, thereby lessening the significance of an analysis that compares such structures. In the preceding analytical examples, I have indeed attempted to discuss relationships inherent between the basic four-note cells. The more important analytical goals, however, have included efforts to: determine how different rhythmic streams are connected; find patterns of cell ordering within streams; discover generative rhythmic structures; and recognize consistencies in the rhythmic design of themes, ostinatos, or other elements. Relationships beyond that of simple cell content clearly exist in these works by Bartók, and the patterns of internal organization evident in these larger units of rhythmic time provide some sense of the possibility that these processes may occur elsewhere in his works.

CHAPTER 5

STRUCTURES OF PROGRESSIVE VALUE

In many instances, TAS analysis reveals various types of patterns within musical sections in Bartók's quartets, and some of these patterns contain arithmetic progressions. These progressions may consist of ascending or descending arithmetic patterns, and they may be organized into a perfect series of consecutive numbers, such as that found in the TAS: $5_1 4_1 3_1 2_1 1_1$. More often, however, these structures show *general* movement toward expansion or compression, such as demonstrated in the following TAS: $5_1 4_1 4_1 1_1 1_1$. These progressions take many interesting forms in the quartets, many of which will be demonstrated in the examples that follow.

Additive Processes in the Works of Other Composers

Additive rhythmic techniques are not unique to the music of Bartók. Written-out *accelerandos* and *ritardandos* have long been recognized in music literature from the Baroque to the 20th century, with examples found in works such as Handel's *Concerto Grosso, Op. 6, no. 7*¹, and Webern's *Orchestral Pieces, Op. 6*². If applied to these types of structures, TAS analysis would reveal arithmetic progressions similar to those discussed above.

Several composers of the 20th century have employed arithmetic organization of rhythmic groups in a manner similar to Bartók. Douglas Jarman cites a number of

¹ Schachter, 316.

² Carl Dahlhaus, "Rhythmic Structure in Webern's *Orchestral Pieces*," In *Schoenberg and the New Music*, trans. by Derrick Puffett and Alfred Clayton (Cambridge: Cambridge University Press, 1987), 179.

examples of arithmetic progression in the *Lyric Suite* in which Berg methodically increases or decreases the durational values of rests occurring between repeated statements of a single rhythmic motive. According to Jarman, the ratio 5:4:3:2:1 is a *structural rhythm* of durational units that appears in its original and retrograde forms in the fifth movement of the *Lyric Suite*. In Berg's works, this series "is employed as an incidental feature and determines the rhythmic presentation of only short passages of music."³ I have found the same to be true in the quartets of Bartók.

Stravinsky also uses additive processes in his rhythmic constructs. In a discussion of *Symphonies of Wind Instruments*, Kramer finds these procedures applied to both cells and *moments*, stating that, "Each time certain figures return, they are extended or compressed by a beat or two."⁴ Ultimately, Kramer finds that with *Symphonies*, Stravinsky "moves beyond simple additive durations and identity relationships. He discovers a principle that he was to develop and refine during the remainder of his career: the use of a single multiplicative ratio to determine most of the moment durations of an entire (or at least a major portion of a) piece."⁵ Of course, Lendvai and others have made a case for similar proportional organization in Bartók's works, but golden section proportions are unrelated to the arithmetic progressions that I will be presenting below.

Timepoint Group Structures

In Chapter 4, *Timepoint Accent Structures* (TAS) were utilized to compare the rhythmic content of various streams and cells from selected musical examples in Bartók's quartets. With this method, the basic rhythm of adjacent timepoint attacks and non-

³ Douglas Jarman, *The Music of Alban Berg* (Berkeley, University of California Press, 1979), 160.

⁴ Jonathan Kramer, *The Time of Music*, 288.

⁵ *Ibid.*, 289.

attacks or timepoint accents and non-accents provided the materials for analytical research. When studying arithmetic progressions, however, a slight change in approach becomes necessary. In considering structures of progressive value, the concept of grouping must proceed beyond that which considers groups of adjacent timepoint *accents* and *non-accents*. Grouping in these structures shifts to a higher level to include units of musical time that are perceptually bound together by their internal associations. Figure 5.1 provides an introduction to the minor changes necessary for analyzing these groups. The brackets above the score in 5.1 delineate the musical divisions created by thematic differentiation. In this excerpt from III/2, there are two basic melodic segments that are first presented on line 1 of the score. These segments are then expanded and repeated twice in the measures that follow. The ensuing progression for the excerpt is {8+8, 10+10, 15+12} or {16, 20, 27}, and since the values of this progression increase successively, it will be referred to as an *ascending progression*. Although each consecutive entry does not increase by the value of 1, (and this is the case with many examples of arithmetic progressions), a *general* numerical increase is evident and demonstrates deliberate rhythmic expansion of a grouping on subsequent occurrences.

Obviously, the numbers in this progression do not represent successive timepoint accents; instead, they represent the *number of timepoints occurring within the span of the group*. Because this representation does not directly reflect timepoint *accents*, these constructs will be referred to as *Timepoint Group Structures* (TGS). The same comparative procedures apply to both TAS and TGS analysis, as both represent grouping on different levels. In fact, TAS analysis is a subcategory of TGS analysis.

8 8

3

pizz. p

10 10

15

4

arco p

12

5

cresc. f piu f senza sord. piu f arco piu f

Figure 5.1: Ascending Progression from III/2, beginning at reh. 3ff.

Figure 5.2 contains a progressive value structure with descending order. Each group consists of a stream of uninterrupted timepoint attacks at the interval of an 8th note. Any break in the stream signifies that the beginning of a new group will follow, and this break can come in the form of an 8th rest or a quarter note (because a quarter note represents an eighth-note attack followed by a non-attack). The resultant TGS is { 16, 10, 10, 6, 5, 5, 4, 4, 4, 4, 4 }, and the timepoint span of each successive group is either equivalent to or less than the number preceding it. To be more precise, this structure could be represented as a TAS with the upper strand representing timepoint attacks as

The image shows a musical score for a piano and string quartet. The first system is labeled '16' and 'Un poco più mosso' and contains measures 88-101. The second system is labeled '10', '10', and '6' and contains measures 102-111. The score features a piano (p) and a string quartet (violin, viola, cello, double bass) with various dynamics and articulations.

Figure 5.2: Descending Progression from IV/4, ms. 88-101

is fairly common within these progressions, as seen in this example, Figure 5.2 and several others to follow.

Figure 5.3: Ascending Progression from IV/1, ms. 149-151

In Figure 5.4, alternating block structures supply the rhythmic organization represented in the TGS, which is found in Figure 5.5. The upper strand of the TGS represents the block defined by staccato 8th notes (found in bold letters above the score), and the lower strand denotes blocks of legato melodic material appearing in individual voices (represented by italicized numbers above the score). The pulse for this representation is a full measure. The lower strand in this example is stable, with two measures in each group, and the upper strand contains a basic descending progression. Because this TGS shows progression in only one strand, it is a *Single Descending Progression*.

Figure 5.4 displays a musical score with three systems. The first system, starting at measure 25, is marked *tranquillo* (♩ = 120) and features dynamics *dim.* and *mf*. The second system, starting at measure 26, is marked *meno tranquillo* (♩ = 144) and features dynamics *mp* and *p*. The third system, starting at measure 27, is marked *più tranquillo* (♩ = 112) and features dynamics *dolce* and *pp*. The score includes various musical notations such as notes, rests, and dynamic markings.

Figure 5.4: Block Structure with Single Descending Progression from II/2, reh. 25ff.

$$\begin{array}{cccccc} 4 & 2 & 2 & 2 & 2 & 1 \\ 2 & 2 & 2 & 2 & 2 & \end{array} \parallel :1 \text{ measure}$$

Figure 5.5: TGS for Single Descending Progression in 5.4

Figure 5.6 contains another excerpt where melodic material in 8th notes is segmented by intermittent rests. As demonstrated by its TGS in Figure 5.7, the lower strand shows no consistent ascending or descending progression; technically, the upper strand shows no consistent ascending or descending progression either. An interesting pattern is created though, and it is one whose design is found repeatedly in grouping structures in the string quartets. The first 5-4 in the upper strand seems out of place with the remaining entries in that strand, but it represents a procedure similar to that revealed in some pitch organization through Schenkerian analysis. *Unterbrechung* (or ‘*Interruption*’), as defined in Ian Bent’s book, *Analysis*, is:

... [T]he principal method of prolongation applied to the fundamental structure (*Ursatz*) of a tonal piece, achieved by ‘interrupting’ its progress after the first arrival on the dominant; this interruption requires a return to the starting-point of the fundamental structure.⁶

Examples of interruption in Schenkerian analysis include 3 2 || 3 2 1 and 5 4 3 2 || 5 4 3 2 1. In each case, the descending progression in the *Ursatz* is broken,

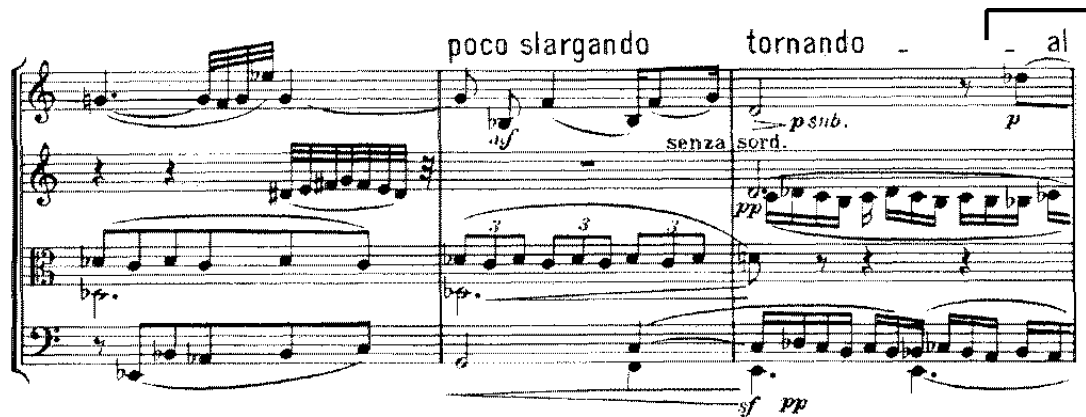


Figure 5.6: Interrupted Descending Progression from V/4, m. 54-59

⁶ Ian Bent and William Drabkin, *Analysis* (New York: W. W. Norton and Co., 1987), 137.

Figure 5.6: Interrupted Descending Progression from V/4 (cont.)

Figure 5.7: TGS for Interrupted Descending Progression in 5.6

restarted and completed. A similar rhythmic situation occurs in Figure 5.6, where a descending progression is interrupted, restarted and completed. These structures will hereafter be referred to as *Interrupted Progressions*.

Figure 5.8 contains a lengthy example of a descending progression with interruption. In this passage, grouping is produced by the initiation of melodic streams or motives in the 1st violin. This excerpt is taken from IV/1, and the TGS is found in Figure 5.9. Prior to the interruption, six groups appear in a descending progression: {24, 24, 18, 12, 9, 6}. At this point in the structure, another descending progression begins: {15, 12, 12, 12, 6, 6, 6, 6}. There appears to be no musical reason to separate these materials into two adjacent progressions; therefore, this single, long progression is one that must be explained as an *Interrupted Descending Progression*.

The musical score for Figure 5.8 is presented in two systems. The first system shows a descending progression of six groups: {24, 24, 18, 12, 9, 6}. The second system shows a continuation of this progression, with a bracketed section labeled '24' and another labeled '117' and '18'. The score includes various dynamic markings such as 'p', 'f', 'cresc.', and 'mp', and a tempo change to 'Ancora più vivo, d. = 178'.

Figure 5.8: Interrupted Descending Progression from IV/1, ms. 109-136

12 9

6 15 12

126

12 12 6

6 6 6

137

Tempo I. (♩ = 140)

cresc.

27"

Figure 5.8: Interrupted Descending Progression from IV/1 (cont.)

24, 24, 18, 12, 9, 6, 15, 12, 12, 12, 6, 6, 6, 6 ||:8

Figure 5.9: TGS for Descending Progression in 5.8

Block structures are once again utilized in the music found in Figure 5.10. This grouping structure, whose TGSs are located in Figure 5.11, contains two primary blocks. The block for the TGS's upper strand contains melodic material derived from the theme of the movement, and the block for the lower strand consists of punctuated chords and *trailing rests* (rests that follow the chord and precede the next statement of the melodic block). Both strands contain a basic descending progression. The first TGS in Figure 5.11 represents the blocks as they occur in measures 320-331. Each strand contains a basic descending progression, and this type of structure is referred to as a Unidirectional Descending Double Progression.

The second TGS in Figure 5.11 represents mm. 332-338, at which point the melodic material in the upper strand's block is replaced by rests. The lower strand still contains punctuated chords. This TGS also contains a descending double progression with a hint of an interruption after the first entry in the lower strand.

Figure 5.12 contains yet another example of grouping progressions found in the string quartets, and this excerpt is taken from VI/3. Groups in this example once again result from alternating block structures, and these blocks are clearly distinguished by differences in articulation, dynamics and texture. The TGS for 5.12 is found in Figure 5.13. This brief passage contains a total of only five groups; however, a pattern may still be ascertained, based on the fact that structures of progressive value frequently occur in

11 8 6 5 2 2 2 2 1 || :8
 2 2 1 1 1 1 1 1

 2 1 1 1 1 1 1 || :8
 3 5 4 4 3 1

Figure 5.11: TGS for Unidirectional Descending Double Progressions in 5.10

The musical score for Figure 5.12 is written in 5/10 time and consists of three systems of staves. The first system (measures 135-140) is marked **Andantino, ♩ = 70** and includes dynamics *pp*, *p*, and *f*. The second system (measures 140-144) includes a measure rest of 19 measures and a tempo change to **Tempo I. (♩ = 98)**. The score features complex chromatic and diatonic movements across multiple staves, with various articulations and phrasing marks. Measure numbers 11, 13, 9, 19, 140, and 145 are indicated at the bottom of the staves.

Figure 5.12: Multidirectional Double Progression in VI/3, ms. 135-144

$$\begin{array}{ccc} 10 & 13 & 19 \\ & 11 & 9 \end{array} \Big| :8$$

Figure 5.13: TGS for Multidirectional Double Progression in 5.12

these quartets. The upper strand clearly contains an ascending progression. Although the lower strand consists of only 2 groups, these groups are placed in descending order, thereby providing a descending progression. The simultaneous occurrence of ascending and descending progressions in the two strands of a TGS will be referred to as

Multidirectional Double Progressions.

Another Multidirectional Double Progression is found in Figure 5.14, which is taken from the Coda of the *Third Quartet*. This particular example can be represented by

Figure 5.14: Multidirectional Double Progression in the Coda of III, reh.15ff.

a TAS, as seen in Figure 5.15. A TGS can also be utilized if the consecutive rests in the passage are considered to be blocks. As in Figure 5.12, the values in the upper strand increase, while those in the lower strand decrease.

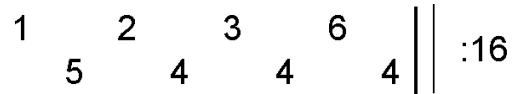


Figure 5.15: TAS/TGS for Multidirectional Double Progression in 5.14

Figure 5.16 contains another multidirectional double progression, but in this case interruption is also present. This example, taken from IV/1, consists of two blocks clearly differentiated by musical content. The upper strand is comprised of an interrupted descending progression, while the lower strand contains an ascending progression, as seen in the TGS of Figure 5.17. In measure 140, the upper strand sounds a misplaced 5 grouping, after which the second strand begins a statement of consecutive groups that form another mini-progression in an ascending pattern. The complete statement of the lower strand in mm. 135-148 actually contains an ascending progression with interruption. To clarify, each strand progresses in different directions and contains interruptions along the way.

Embedded progressions may occur in TGS analysis, as seen in Figure 5.18. This excerpt from IV/5 is grouped by blocks whose borders become evident when viewing the bracketing provided on the score. Once again, multidirectional double progression is present, as clearly seen in the TGS in Figure 5.19. The unique feature to be noted here, however, is the presence of embedded progressions found within the last two larger groups of the lower strand.

The musical score consists of four systems, each containing three staves (treble, alto, and bass). The key signature has one sharp (F#). The score is divided into four systems by double bar lines. Measures are grouped with brackets and numbers: 12, 2, 7, 4, 5, 4, 7, 6, 5, 8, 3, 9, 2, 11, 5, 6. Measure numbers 135, 140, and 145 are boxed. Dynamics include sf, p, f, and mp.

Figure 5.16: Interrupted Multidirectional Double Progression in IV/1, ms. 134-148

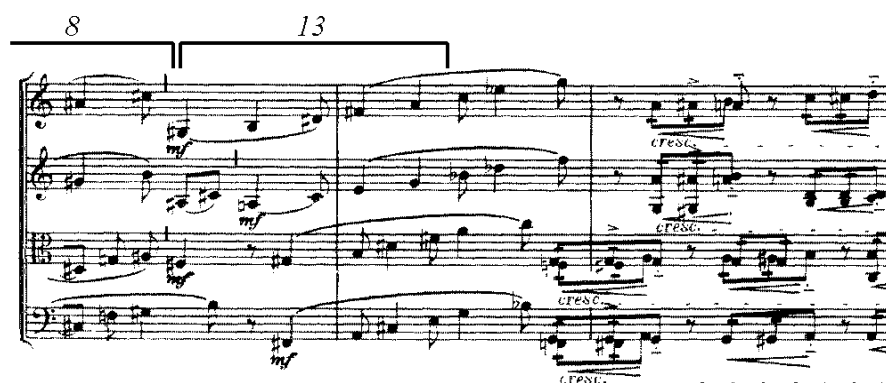


Figure 5.16: Interrupted Multidirectional Double Progression in IV/1 (cont.)

$$\begin{array}{cccccccccccc|c} 12 & 7 & 5 & 7 & 5 & 3 & 2 & (5) & & & & & \\ 2 & 4 & 4 & 6 & 8 & 9 & 11 & 6 & 8 & 13 & :8 \end{array}$$

Figure 5.17: TGS for Interrupted Multidirectional Double Progression in 5.16

Figure 5.18: Embedded Multidirectional Double Progression from IV/5, ms. 341-362

The image shows two systems of musical notation. The first system consists of three staves (treble, alto, and bass clefs) with a figured bass line below. Above the first staff, there are bracketed figures: 10, 13, 11, 6, 2, 3, and a dynamic marking mf . A box containing the number 350 is placed above the first staff. The second system also has three staves with a figured bass line. Above the first staff, there are bracketed figures: 6, 3, 3, 3, 3, 4, 3, and a dynamic marking pp . The word *arco* is written above the first staff, and *schierzando* is written below the first and third staves. The bass line in the second system has a *schierzando* marking.

Figure 5.18: Embedded Multidirectional Double Progression from IV/5 (cont.)

The image shows a TGS (Tonal Grammar System) diagram. It consists of two rows of figures. The top row has figures 24, 10, 13, 11, 6, and a repeat sign followed by :8. The bottom row has figures 6, 3, 2, 3, 3, 3, 4, 3, and a repeat sign followed by :8. Brackets connect the figures in the top row to the figures in the bottom row: 24 to 6, 10 to 3, 13 to 2, 11 to 3, 6 to 3, and 11 to 3.

Figure 5.19: TGS for Embedded Multidirectional Double Progression from 5.18

If viewed as a separate TGS, these embedded streams in 5.18 presents progressions as well. The upper and lower strands of this embedded structure follow the prototype of its parent TGS by producing a multidirectional double progression.

One final example will complete the catalogue of distinct models found for structures of progressive value. The fifth movement of the *Fourth Quartet* contains a passage with a slightly different type of embedding than that shown in Figure 5.18. Figure 5.20, whose TGS is found in 5.21, contains a multidirectional double progression in which blocks are clearly distinguished in the score. The final group in the lower strand contains an embedded geometric progression found in the 16th note figures in mm. 141-145. The upper strand in this sub-progression is ascending and the lower strand is stationary; therefore this embedded TGS is a single ascending progression.

Conclusions

Analysis of Rhythmic Contour

As noted in chapter 3, Marvin's rhythmic contour analysis is appropriate for application to the types of grouping structures discussed in this chapter. When each entry in the TAS/TGS is replaced with a number corresponding to its relative length to all others in the strand, a very clear picture of the basic progression emerges. For example, the TGS for the interrupted multidirectional double progression found in Figure 5.17 could be substituted with the following rhythmic contour TGS:

4	3	2	3	2	1	0	(2)	
0	1	1	2	3	4	5	2	3 6

18

120 125

ff *2* *simile*

11 2

130 135

sempre simile

8

6 2 9 2

Figure 5.20: Embedded Multidirectional Double Progression from IV/5, ms. 121-148

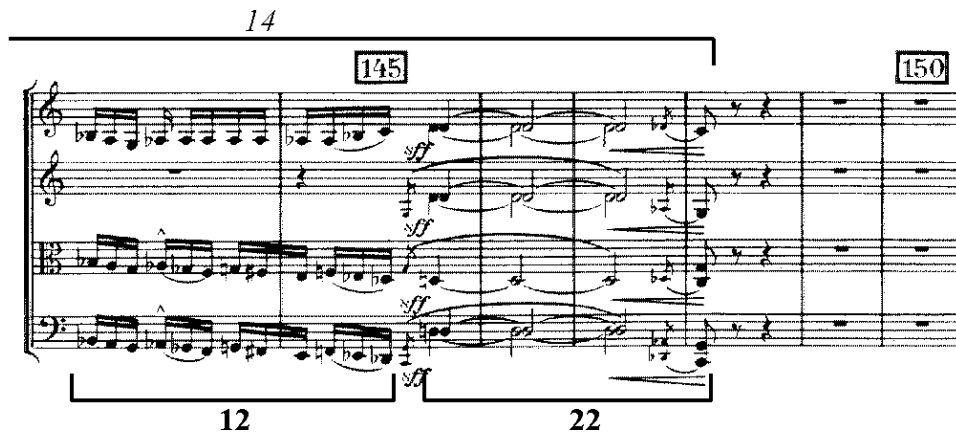


Figure 5.20: Embedded Multidirectional Double Progression from IV/5 (cont.)

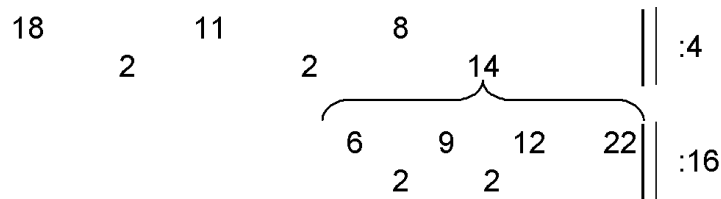


Figure 5.21: TGS for Embedded Multidirectional Double Progression in 5.20

Although rhythmic contours simplify the design and clarify structure, they are not necessary for discerning patterns discussed thus far in this study. They may nonetheless be of benefit in discovering patterns in the many block structures that do not conform to ascending or descending progression.

Principles of Pitch Organization and Corresponding Rhythmic Procedures

Ascending and descending progressions within TGS strands represent respective expansion and compression of the durational content of consecutive groups. Similar processes are applied to pitch in the quartets, and Antokoletz discusses these at length. An excellent example of the progression of cells is found in the exposition and development of IV/1, where *X* progresses to *Y*, and *Y* then progresses to *Z*. Each step in

this short progression represents not only a shift to another cell but an expansion to a collection with a broader range.⁷

The progression of scalar materials from one type to another can also provide a sense of expansion or compression. Antokoletz describes the technique:

The basic principle underlying these transformational processes is described by Bartók as ‘extension in range,’ in which chromatic material is expanded into diatonic themes. (The reverse is called ‘chromatic compression.’) Special non-diatonic modes, most notably the octatonic scale – with its regular alternation of whole and half steps – serve as the intermediary stages between chromatic and diatonic materials. Through this procedure, Bartók stated, ‘we will get variety on the one hand, but the unity will remain undestroyed because of the hidden relation between the two forms.’⁸

It is not my intention to demonstrate somehow that pitch and rhythm expansion and compression coincide or that these procedures control many parameters in the compositions of Bartók. It is, however, fascinating to realize that some of the concepts put to use in the structuring of pitch may have been consciously or subconsciously transferred to the element of rhythm, or vice versa. As discussed in chapter 4, the basic elements of pitch organization, such as cellular construction and manipulation, may find companion techniques in rhythmic structuring.

Prior Findings Related to Arithmetic Progressions in Bartók’s Works

Finally, it must be noted that I am not the first to recognize arithmetic progressions in Bartók’s quartets. Antokoletz cites numerous examples of these progressions in *The Music of Béla Bartók*, and he also notes several additional illustrations in his master’s thesis. With one exception, none of the examples provided in my study are addressed by

⁷ Antokoletz, 118.

⁸ Antokoletz, “Middle Period String Quartets,” In *The Bartók Companion*, ed. Malcolm Gillies (Portland: Amadeus Press, 1994), 259-260.

Antokoletz. The distinction between his findings and my own lies in the inclusion of interruption, the recognition of embedded structures, and the presentation of models for structures of progressive value. In addition, I have used TAS/TGS analysis, and this representation can produce results that differ slightly from those found by other theorists.

CHAPTER 6

SYMMETRICAL STRUCTURES

Symmetrical Pitch Constructs in the Works of Bartók and other Composers

Composers of art music have long used compositional processes that employ symmetrical configurations of pitch. Antokoletz provides a summary of the symmetrical constructs typically found in the works of certain composers, and notes Bartók's unique approach to symmetry in the following passage:

Certain types of symmetrical procedures became associated with certain composers: a few instances are the pentatonic and modal scales of Debussy and Stravinsky, the whole-tone scale of Debussy, the octatonic scale of Rimsky-Korsakov, Scriabin, and Stravinsky, and the use of strict inversive symmetrical procedures in the atonal works of the Viennese composers. Bartók's works (and, to a lesser extent, Kodály's) can be considered as a historical focal point for all these musical sources, since in the course of his compositional evolution he comprehensively absorbed and integrated all these formations (both traditional and nontraditional) into an all-encompassing system of symmetrical relations.¹

George Perle also finds that Bartók uses symmetry in a manner quite different from that of his predecessors:

The impressionists employed symmetrical formations in order to suspend temporarily the effect of key-centre, to neutralize any tendency towards motion, and to de-emphasize motivic characteristics and developmental procedures; Bartók's intentions are precisely the opposite in every respect, and his symmetrical formations are one of the compositional means through which he realizes his purposes.²

Both Perle and Antokoletz recognize that symmetrical organization permeates the mature works of Bartók. His use of these symmetries is reflected in intervallic cells, scale formations, interval cycles, tonal centricity based on axes of symmetry, symmetrical

¹ Antokoletz, *The Music of Béla Bartók*, 25.

² Perle, "Symmetrical Formations in the String Quartets of Béla Bartók," *Music Review* 16 (1965): 302.

transformations of the folk modes, and large-scale arches formed by thematic or stylistic connections between various movements of the quartets.³ Although Perle encounters an abundance of symmetrical components in his analysis of the string quartets and finds that Bartók uses these procedures to provide a sense of stability and unity, he is hesitant to suggest that this process is more than an “incidental aspect of his total compositional means.”⁴ Jonathan Bernard, in his article “Space and Symmetry in Bartók,” presents an opposing point of view:

Perle’s statement seems strangely at odds with the evidence that he cites—evidence which though hardly conclusive, certainly invites further investigation. One is reluctant, after encountering so many striking instances of symmetrical construction, to dismiss them as mere curiosities. . . . Perhaps the problem resides in the definition of the phenomenon itself. One point that has not been stressed in the relevant literature is that there is a difference between instances of symmetry in which the relationships are consistently represented in literal, registral terms, and instances in which registral representation is only partially or not at all present.⁵

Bernard’s subsequent analysis assumes a broader concept of symmetrical organization in which:

[A] (multivalent) symmetrical system may work to create unity by operating, not exclusively on one level, but rather in many different ways at once, ranging from control of single chords or motives to control of large sections of music. Indeed, it should be possible, if symmetry is a significant force, to discover a hierarchy of relationships in which smaller symmetries contribute to larger ones, which in turn contribute to even larger ones, and so on, across ever longer spans of time.⁶

Although the examples that Bernard uses to demonstrate this symmetrical scenario are confined to pitch analysis only, I have found that such hierarchical relationships are present in some rhythmic entities as well.

³ Antokoletz, 26-311.

⁴ Perle, 312.

⁵ Bernard, “Space and Symmetry in Bartók,” *Journal of Music Theory* 30/2 (1986): 186.

⁶ Bernard, 192.

If in fact symmetrical constructs are plentiful in pitch and structural formations throughout the quartets and other works, as demonstrated by Antokoletz and Perle, it seems reasonable that similar *rhythmic* configurations could be present in his works as well. If any method of organization has been systematically applied to one parameter, one must logically assume that other parameters may have been subjected to the same constructive processes. As illustrated in chapters four and five, some of Bartók's methods of pitch organization (such as cellular construction, expansion, and progression) find parallels in his rhythmic structuring. This chapter demonstrates that Bartók used symmetries in both pitch and rhythmic constructs as well. In the examples that follow, I will present a number of instances where rhythmic structures contain various types of symmetrical formations.

Analytical Examples

A basic symmetrical structure is present in the rhythmic stream found in the cello line of Figure 6.1 below, and the TAS for this stream is found in 6.2. This segment,



Figure 6.1: Symmetrical Rhythmic Structure from IV/2, ms. 169-172

$$\left| \begin{array}{c} 1 \\ 3 \end{array} \right| \left| \begin{array}{c} 1 \\ 2 \end{array} \right| \left| \begin{array}{c} 1 \\ 1 \end{array} \right| \left| \begin{array}{c} 1 \\ 2 \end{array} \right| \left| \begin{array}{c} 1 \\ 3 \end{array} \right| :8$$

Figure 6.2: TAS for Symmetrical Rhythm in 6.1

taken from IV/2, contains an example of perfect TAS symmetry created by a pattern of pitch onset, and the symmetrical properties of this stream would not be evident in comparing *durations*. Essentially, any rhythmic unit with symmetrically-ordered durations will have a corresponding TAS whose ordering will also be symmetrical; however, symmetrical TAS structures do not necessarily imply symmetrical durational streams. I must further note that any hemiola such as this will exhibit a symmetrical TAS structure.

In Figure 6.3, an ostinato pattern in the cello line contains a three-measure segment with two adjacent symmetrical units. The TAS in Figure 6.4 shows that measures 1 and 2 are rhythmically symmetrical; measure 3 contains a single cell with internal symmetry. In the passage that follows this excerpt, the 3-measure unit is repeated more than 4 times. When the TAS for this extended pattern is compressed and repeated, a number of additional overlapping symmetries become evident, and these symmetries do not correspond with repetitions of the 3-measure pattern. The compressed stream with repetition produces the following TAS:

$$\begin{array}{cccccccc} 3 & 2 & 3 & 2 & 3 & 2 & 3 & 2 \\ 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \dots \end{array}$$



Figure 6.3: Adjacent Symmetrical Rhythmic Structures from IV/2, ms. 188-190

$$\left| \begin{array}{ccc} 3 & & 1 \\ & 2 & \end{array} \right| \left| \begin{array}{ccc} 1 & & 3 \\ & 2 & \end{array} \right| \left| \begin{array}{ccc} 2 & & 2 \\ & 2 & \end{array} \right| :8$$

Figure 6.4: TAS for Adjacent Symmetries in 6.3

Figure 6.5 contains an embedded symmetrical structure that corresponds to the multivalent system discussed by Bernard earlier. The TAS for this example, found in 6.6, reveals two 2-measure symmetries within a larger 6-measure symmetrical structure. When a musical passage consists of a continuous stream of equal note values, such as found in 6.5, one must determine the most obvious means by which accent is produced (if at all). Although continuous quarter notes sound in octaves in this excerpt, slurred pitches provide a noticeable accent pattern. Entries in the upper strand of this TAS represent those pitches connected by slurs.



Figure 6.5: Embedded Symmetries from II/2, beginning in the 10th ms. of reh. 37

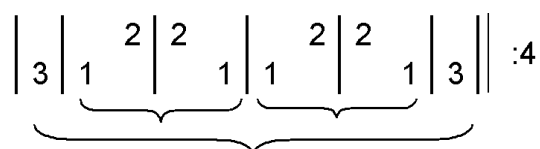


Figure 6.6: TAS for Embedded Symmetries in 6.5

A different type of symmetrical structure is found in Figure 6.7, which is extracted from the opening measures of the *Seconda Parte* of the *Third Quartet*. Beginning in bar five, a seven-measure melodic passage is presented in the cello line, the TAS for which is found in Figure 6.8. Measures three and four of the TAS together form a symmetrical unit. Although rhythmic units surrounding these bars are not purely symmetrical, measures 1-2 and 5-6 *are* direct repetitions. This type of ordering is sometimes referred to as *symmetry by group*, the concept of which is more closely-related to arch forms than precise mirrored images. For example, all A-B-A pieces are inherently arch forms, but they are not symmetrical in the purest sense. The same can be said of those TAS or TGS structures that are symmetrical by group.

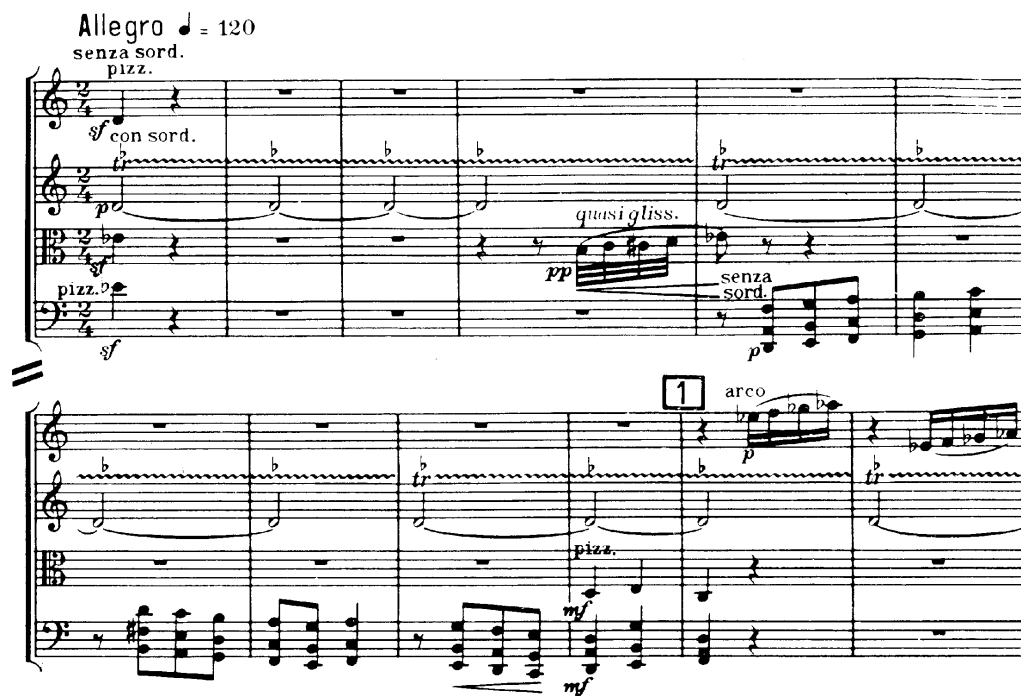


Figure 6.7: Symmetry by Group from III/2, ms. 5-11

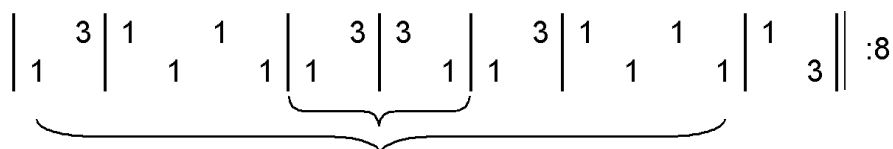


Figure 6.8: TAS for Symmetry by Group in 6.7

Symmetry within a structure need not be perfect in order to have been conceived as a symmetrical design. Numerous examples of near-perfect symmetrical TAS streams appear in Bartók's quartets; instead of dismissing these streams as invalid, it seems logical to include them for discussion because of their frequent occurrence and their close relationship to true symmetrical structures. Two statements made by Stravinsky on separate occasions seem to confirm that these imperfect constructs should indeed be

considered. In *Conversations with Igor Stravinsky*, he said, “[T]o be perfectly symmetrical is to be perfectly dead.”⁷ He also stated that a composer’s original compositional schemes may be adjusted at will during the compositional process if deemed necessary:

I regard my feelings as more reliable than my calculations. . . (while) our feelings and our calculations obviously overlap . . . I will persist, nevertheless, and say that I trust my musical glands above the foolproofing of my musical flight charts, although the flight charts are formed in part by the same glands; and add that I prefer to exercise the ‘free’ option of my ear, rather than submit to a punch-card master plan.⁸

If composers make adjustments to predetermined structures in order to obtain a more desirable musical result, as Stravinsky suggests, then analytical methods that consider such structures to be altered forms of more perfect patterns are well-supported. Figure 6.9, taken from *Il/2*, contains a symmetrical TAS that has been altered at the end of the stream. The TAS for this example is taken from the pattern of pitch onset in the thematic material found in the cello part, from the 3rd measure of rehearsal number 7 through the third bar of rehearsal number 8. As seen in Figure 6.10, the center of this symmetrical construct is located between measures 6 and 7 of the extracted TAS. Measures 1-5 provide an embedded symmetry within the larger TAS stream, and these opening measures are restated with transformation in measures 8-13. Had the second statement of this structure been a direct repetition of the original rhythmic material in mm. 1-5, a perfect symmetrical stream would have resulted; however, Bartók chose to modify the final materials and thereby avoid symmetrical closure.

⁷ Stravinsky and Craft, *Conversations with Igor Stravinsky*, 20.

⁸ Pieter van den Toorn, *The Music of Igor Stravinsky*. (New Haven: Yale University Press, 1983), 212.

The musical score consists of three systems, each with three staves (treble, alto, and bass clefs). The key signature has two flats (B-flat and E-flat). The first system is marked with a box containing the number 7 and a tempo indication of quarter note = 192. Dynamics include *ff*, *sf*, *mf*, *p*, and *mf*. Articulations include *pizz.* (pizzicato) and *arco* (arco). The second system continues the melodic and harmonic development. The third system is marked with a box containing the number 8 and features *sf* (sforzando) dynamics. The score ends with a repeat sign and a final *sf* dynamic.

Figure 6.9: Symmetry with Embedding and End-Alteration in II/2, third ms. of reh. 7

The TAS diagram shows a sequence of numbers in boxes, grouped by a brace underneath. The sequence is: 1, 3, 4, 4, 4, 3, 1, 1, 2, 1, 1, 2, 1, 1, 3, 4, 4, 4, 1, 1, 2, 1, 1, 2. The sequence ends with a double bar line and a repeat sign followed by the number 8.

Figure 6.10: TAS for Embedded, End-Altered Symmetry in 6.9

The passage in 6.11 contains an alteration process similar to that found in 6.9, with the exception that modification to the symmetrical structure takes place at the beginning of the stream. The TAS in 6.12 spans measures 32–43 and reflects the pattern of accents produced by the onset of each chord within the stream.

The image displays three systems of musical notation, likely for piano and orchestra. The first system consists of four staves (treble and bass clefs for piano and orchestra). It features a key signature of one sharp (F#) and a common time signature (C). The music is marked with *sempre ff* (sempre fortissimo) across all staves. The second system also has four staves and continues the musical passage, marked with *sf* (sforzando) in the piano part. A rehearsal mark '40' is placed above the fourth staff of this system. The third system has four staves and includes dynamics such as *p* (piano) and *mf* (mezzo-forte) in the piano part, while the orchestra part remains marked with *sf*.

Figure 6.11: Group Symmetry with Beginning Alteration and Embedding from II/2, sixth measure after rehearsal number 39

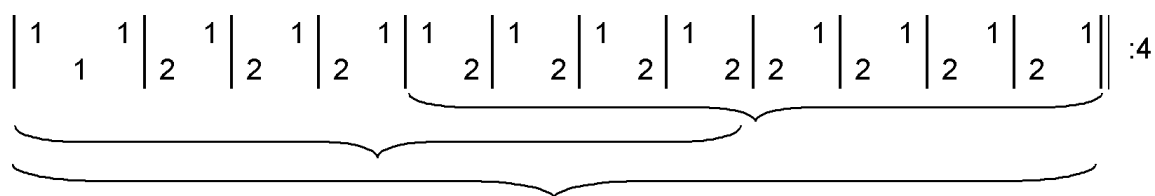


Figure 6.12: TAS for Altered and Embedded Group Symmetry in 6.11

Embedded structures are again present within the larger TAS stream. Although the embedded structures contain mirrored symmetry (or in the case of measures 1-8, *altered* symmetry), the entire structure is symmetrical by group.

The selection in Figure 6.13 is taken from VI/3, and it contains a rather unusual presentation of symmetrical procedures. The ostinato pattern supplied by the viola and cello in measures 46-59 presents a fairly consistent stream of eighth, quarter, and dotted-quarter durations. The entire stream, whose TAS is found in Figure 6.14, divides into 10 contiguous symmetrical segments, only one of which is repeated literally within the course of the excerpt. I cannot discern any correlation between the beginning of each of these segments and any other significant events that occur within the passage. Neither do I find any pitch or dynamic changes within the stream itself that correspond to the symmetrical segmentation. It appears that these adjoining groups are independent units whose tenuous connections only exist because of their presence in small, symmetrical rhythmic structures.

accel. tornando al tempo (♩ = 100)

46

IV. *au talon*
punta d'arco
punta d'arco

50

au talon
mp
mp
mp

55

ord.
IV *p*
au talon
in rilievo
au talon

Figure 6.13: Adjacent Symmetrical Segments in an Ostinato from IV/3, ms. 46-59



Figure 6.13: Adjacent Symmetrical Segments in an Ostinato from IV/3 (cont.)

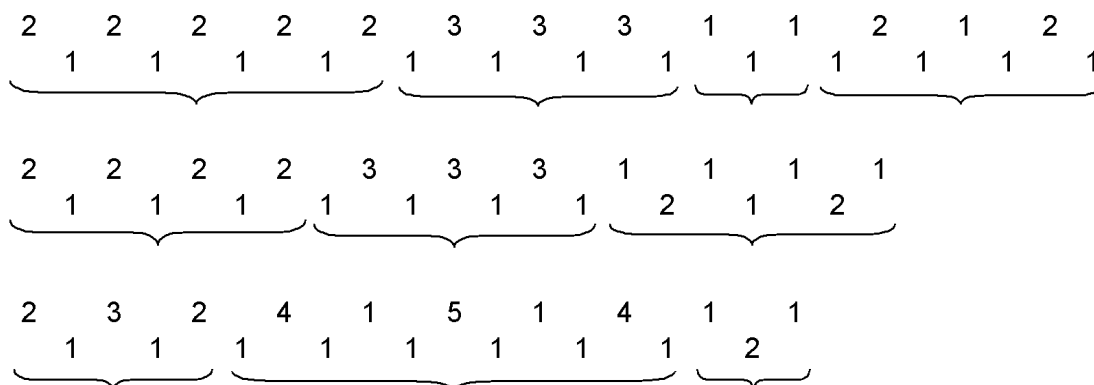


Figure 6.14: TAS for Symmetrical Ostinato Segments in 6.13

Large-scale symmetrical units combine with progressive value constructs and elided TAS structures to form a complex of hierarchical relationships in the final musical example found in 6.15. The score for this excerpt is taken from mm. 1-27 of IV/4. The TGS for this structure is found in 6.16, and it is also bracketed on the score in 6.15. Each group in this TGS corresponds to individual units occurring in the ostinato provided by the viola and cello parts. The beginning of each unit is defined by the accent mark

provided first in the cello part in measures 1-13, and later in the viola part in measures 14- 28. Every ostinato unit follows a basic durational formula, which is presented below:

$$\text{♩} \{ (\text{♩} \times n) \}$$

Theoretically, each unit may be expanded to include the following accented note, thereby resulting in a new formula for each segment:

$$\text{♩} \{ (\text{♩} \times n) \} \text{♩}^{\text{acc}}$$

If these expanded units are then elided with adjacent units, the result becomes a series of symmetrical structures that vary in size but adhere to a basic pattern. The elision of consecutive units is represented by the following formula, and this stream accurately depicts the pattern of rhythm found in the ostinato of measures 1-27:

$$\begin{array}{ccccc} & & \text{♩} \{ (\text{♩} \times n) \} \text{♩} & & \text{♩} \{ (\text{♩} \times n) \} \text{♩} \\ \text{♩} \{ (\text{♩} \times n) \} \text{♩} & & & & \text{♩} \{ (\text{♩} \times n) \} \text{♩} \end{array}$$

The TGS itself is also symmetrical in design, as seen in 6.16. Three distinct arches are formed by the increasing and decreasing rhythmic content of each ostinato unit represented in the TGS. The first large group contains altered symmetry, while the second and third groups are perfectly symmetrical. It is also evident from this representation that a broad, descending progression is created by these arch groups. The total durational content of each group consists of 37, 29, and 17 quarter-note pulses respectively. The concept of descending progression appears to control the large-scale rhythm of these TGS groups.

Allegretto pizzicato, $\text{♩} = 142$

5 6 10 15 20

5 6 7 6

Figure 6.15: Adjacent Arches in Ostinato Groups from IV/4, mm. 1-27



Figure 6.15 (cont.)

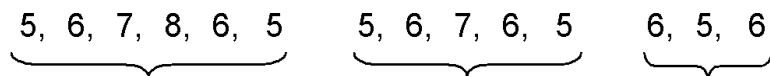


Figure 6.16: TGS for Ostinato Group Arches in 6.15

Perception and Symmetrical Rhythms

There is presently some debate as to whether symmetrical rhythmic constructs on any scale may be perceived by the listener at all. Some researchers claim that the analysis of such structures should be dismissed or invalidated because experiential

confirmation of these symmetries is virtually impossible. Jonathan Kramer addresses these issues as they relate to pitch organization and proportional rhythms:

It has been demonstrated that most listeners, including many highly trained musicians, cannot aurally extract the twelve-tone row in many serial passages. Yet it would be a mistake to conclude that the row and its manipulations are irrelevant. The row itself may not be heard, but its effects are. . . . Similarly, we do not directly or literally hear the *Urlinie* in a long, complex, tonal work, yet its existence does have much to do with the way the work unfolds on the foreground. . . . Although proportional systems (of rhythmic structure) . . . may not be heard directly, they may well be perceived subconsciously, just as atonal sets, twelve-tone rows and tonal *Urlinien* are. The music is the way it is in part because of its proportions.⁹

I wholly agree with Kramer's assertions. The ability to conceptualize musical relationships uncovered in analysis allows for a greater understanding of the structure of the music itself, even if this structure is only "perceived subconsciously." The legitimacy of any theoretical approach is confirmed by consistent findings that result from the application of its procedures in a manner that does not conflict with reason and logic.

⁹ Jonathan Kramer, *The Time of Music*, 329.

CHAPTER 7

CONCLUSIONS

The twentieth-century produced music that in many ways abandoned long-established traditions of tonal music, breaking new ground in the treatment of melody, harmony, form, instrumentation, and other musical elements. Rhythm, in particular, underwent tremendous changes, with some of the more drastic transformations occurring in compositions utilizing techniques of non-linearity, total serialization, aleatory and minimalism. In recent years, theorists have begun to develop methods for discussing the rhythmic organization of such music. There is, nevertheless, a substantial body of work in the 20th century whose rhythmic devices are not so far removed from those of the common practice era. This music is represented in part by selected works of Igor Stravinsky, Karel Husa, Zoltán Kodály, Nicolay Rimsky-Korsakov, Ernst Dohnanyi, and Robert Muczynski. In my opinion, however, this rhythmic style is most consistently exemplified by the works of Béla Bartók.

The rhythms of this music occur within a metric context, but meter is treated in very different manner than in tonal music. Prior to the 20th century syncopated rhythms were not uncommon, but the authority of meter was never truly challenged. In the music of the composers mentioned above, however, rhythmic patterns frequently battle the dominant metric grid with persistent syncopation, shifts of meter, and metric superimpositions. Even in instances where meter is suspended, there is the expectation of a metric return, and this expectation is almost always fulfilled. This rhythmic environment, with its struggle against the confines of metric hierarchy, calls to mind similar efforts by Wagner, Scriabin, Prokofiev, Debussy and many others of the late 19th

and early 20th centuries to push the limits of the tonal hierarchy. In each case, composers operate within the constraints of an established system while expanding the boundaries of that system almost to the point of destruction.

It might seem that analytical techniques used for examining rhythms of tonal music might transfer to the body of transitional works noted above since both occur within metric environments; but most tonal methods do not separate rhythmic and harmonic considerations. Other analytical methods of rhythm applied effectively to more experimental 20th century music could be used to uncover significant rhythmic processes in the music of Bartók and others using like methods, but these approaches usually do not refer to meter, and most do not discuss distinct rhythmic units. Any analytical technique appropriate for the analysis of this type of rhythmic style must include the following:

1. A means for representing distinct rhythmic patterns that may result from any kind of impetus in a musical texture
2. A means for discerning the notated (or perceived) metrical context of such rhythms
3. A means for viewing rhythmic patterns independent of meter in order to discover recurrent structures that transcend metrical delineation
4. A means for comparing rhythmic structures in many ways and on many levels

Given a procedure that allows for the discussion of rhythmic entities in the manner suggested above, how should a process of comparing these structures proceed?

A clue as to analytical direction is found in the pitch and form organization utilized by Bartók himself. We know that he uses cellular procedures in pitch; symmetrical construction in sectional design, cell structuring, and pitch axes; and processes of

expansion and contraction in cells and scalar materials. Logically, the analytical starting point for rhythmic discoveries might be one that approaches rhythm from these same perspectives. A methodology for rhythmic analysis must then include a system that allows theorists to draw associations between rhythmic units related by processes of retrograde, complementation, rotation, exchange, expansion and contraction. In addition, symmetrically organized units must be easily distinguishable.

As a result of these requirements, I have developed an analytical system that I believe allows for the consideration of all relationships stated above. With TAS and TGS analysis, one may specifically represent rhythmic patterns produced by any type of impulse in a musical texture, whether it be a pattern resulting from pitch onset, various accent generators, or rhythms produced by intervals between initiation points of larger adjacent groups. The strengths of this approach are found in the flexibility of application to any type of rhythmic patterning, the ability to characterize these patterns with or without metrical context, and the capability of easily comparing rhythms occurring on many levels in many different settings. In addition, the TAS and TGS method allows one to extract materials that most clearly define the rhythmic makeup of a passage, that is the patterns of accent that may be produced by any number of factors. These rhythms may then be systematically represented in a manner that clearly reflects content. To my knowledge, no other approach has provided for the extraction and representation of specific rhythmic entities associated with patterns of accent.

In this dissertation, I believe that I have demonstrated that TAS and TGS analysis is appropriate for discerning the most prominent rhythmic materials within a musical work, and that comparative processes are effectively performed with this method.

Furthermore, an examination of Bartók's rhythmic organization with this system has indeed revealed consistencies of technique in the rhythmic patterning in cells and streams, the generation of progressive value constructs, and the creation of symmetrical rhythmic units.

Further study involving these analytical techniques could include:

1. Exploring the rhythmic content of a single work or movement: Bartók's *Allegro Barbaro* may be an appropriate choice, given the similarities between its rhythmic content and that of the ostinato movements referenced in this study.
2. The application of TAS and TGS analysis to the works of other composers whose rhythmic *sound* is similar to that of Bartók: It may well be that other 20th century composers, such as those mentioned above, use rhythmic patterns that differ significantly from those discovered in this study, or perhaps they organize their patterns in a manner different from Bartók. Exploring numerous works by a single artist, as was done in this study, could provide insight into the unique rhythmic design of each composer considered.
3. The association of specific rhythmic patterns with corresponding pitch patterns: It is possible, for example, that symmetrical pitch constructs coexist with symmetrical rhythmic constructs, or that pitch and rhythmic expansion coincide.
4. The interaction of meter and rhythmic patterns: Because the music of Bartók is filled with syncopation and metric irregularities such as those mentioned earlier, a study of the manner in which rhythmic entities affect the metric environment would undoubtedly be valuable. One might explore, for example, the numerous passages in which the perception of meter is shifted to the *wrong* beat, or areas

where metrical orientation is temporarily lost or suspended. Conceivably, one may discover consistencies in technique in areas of metric conflict between highly contrasting musical passages.

A number of options for further exploration obviously exist, and it is my hope that the findings presented in this study and the methodology ultimately utilized to reveal these findings will provide a solid foundation for the examination of other metrically-based works of the 20th century.

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